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The national domain in Canada
and its proper conservation

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COMMISSION OF CONSERVATION
CANADA

The National Domain in Canada and its Proper Conservation

BY
FRANK D. ADAMS, Ph. D., D. Sc.

OTTAWA, 1915

The National Domain in Canada and its Proper Conservation

Presidential Address before the Royal Society of Canada, 1914

BY

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Dean of Faculty of Applied Science, McGill University
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Land originally forested, but burned over and washed away until the stony subsoil is exposed. This particular location has been homesteaded. Crows Nest District, Alberta. (From Forestry Branch, Department of the Interior.)

Good forestry practice. The forest as a resource perpetuated by wise use. Fire damage minimized by proper brush disposal. A future stand of merchantable timber assured by preservation of young growth.

PLATE A.

The National Domain in Canada and its Proper Conservation

IT IS in many ways an exhilarating experience, that of living in a new country and in a time of rapid development.

We, the Canadian people, have entered into a great heritage—half a continent—standing midway between two of the most densely populated areas of the earth, Europe and Eastern Asia, and having to the south one of the most progressive nations of the world. We are blest with a most liberal form of Government and have ample room for expansion, and are thus free from the many limitations which beset the densely crowded peoples of other countries; we are also free from the ever-present danger of war and invasion which, like the sword of Damocles, hangs over the head of every nation of the older world. This gives a sense of security which is never felt in the countries across the seas. We have, moreover, the advantage of the protection of a great Empire while bearing less than our proper share of its burdens.

The population which is rapidly flowing into the Dominion is furthermore of a relatively high quality.

Of the 384,867 immigrants who came to Canada in the year 1913, 65 per cent were from Great Britain and Ireland or from the United States and, consequently, spoke the English language as their native tongue, while of the immigrants entering the United States a relatively much larger percentage come from Southern Europe.

Even our somewhat bracing climate is not without its advocates. I remember to have heard Dr. Parkin remark one bright winter's day, when the thermometer stood at -20° F., that our cold winter was one of Canada's best assets seeing that it keeps away negroes and all those other undesirable elements of permanent population, classed by the unlearned under the comprehensive title of "dagos." We have, in fact, been told on high authority that the twentieth century belongs

to Canada, and any one who travels in Western Canada and talks with our people there, will certainly be led to believe that this is their understanding of the case.

Canada is often referred to as being in her "constructive period." The United States is somewhat more advanced in its material development, having now nearly completed its "constructive period." Its chief lines of railway were built some years ago, its free lands are taken up and the country is settled. The crops once largely exported are now for the most part required to feed its own people. Canada may read its own immediate future by studying the present situation in the United States—a generation ago her West was as ours is now.

We find, however, that in the great Republic to the south a very strong note of warning is already being sounded in respect to its future. This took form in an address delivered by President Roosevelt to the Society of American Foresters in 1903. In September, 1906, Mr. James J. Hill delivered an address which presented for the first time in popular form, under the title, *The Future of the United States*, a remarkable collection of economic facts. Let me give a brief summary of its contents:

The supply of coal and iron, a prime factor in the nation's industry and commerce, was being exhausted at a rate which made it certain that before the end of the century the most important manufactures would be handicapped by a higher cost of production. The supply of merchantable timber was disappearing at a much more rapid rate. But far more serious than all other forms of wastage was the reckless destruction of the natural fertility of the soil. Within a period for which the present generation was bound to provide, the United States would be hard pressed to feed its own people. Mr. Hill told his hearers that the danger which threatened the future food supply of the nation could be averted only by the intelligence and industry of those who cultivated the farm lands, and that they had it in their power to provide a perfectly practicable and adequate remedy by applying the discoveries of physical science to the business of farming.

Many other leading men in the United States, among whom Mr. Gifford Pinchot must be especially mentioned, became impressed with the importance of these great questions, and in May, 1908, President Roosevelt called, at the White House in Washington, a conference of the Governors of all the States in the Union, members of the Cabinet, justices of the Supreme Court, together with the heads of the great scientific bureaus of Washington, and other leading citizens, to consider the question of "the Conservation of our Natural Resources," stating that, in his opinion, this was "the weightiest problem now before the

nation." The importance which was attached to this conference was marked by the fact that, for the first time in the history of the nation, the Governors of all the States were assembled to consider a great national question. This led to the appointment of a National Commission of Conservation.

Following this, the Governments of Canada, Newfoundland and Mexico were invited to join with the Government of the United States in appointing representatives to a North American conference to meet in Washington in February, 1909. Upon the receipt of the report of the Canadian representatives at this great conference, our Government decided to appoint a permanent Commission of Conservation in Canada, which Commission has been actively at work since that time under the able chairmanship of Hon. Clifford Sifton.

If the conservation of their natural resources is a question of such pressing importance in the United States, it is of equal, if not of greater, importance here in the Dominion of Canada; it is of the greatest moment for the future of Canada that the leaders of our national thought, and through them all the citizens of our Dominion, should be seized with the importance of the principles underlying this great movement. I, therefore, desire this evening to bring to your attention certain salient facts concerning our natural resources, their proper development and their conservation.

It is a common idea that the conservation of our natural resources means hoarding them for the use of future generations. This is an entire misconception. Most of our natural resources are best conserved by working and developing them. Our forests, our lands and our fisheries will, if properly worked, not only yield this generation a larger profit, but they will be handed on to our successors in a more highly productive condition than that in which we received them. We are prosperous now, but we must not forget that it is just as important that our descendants should be prosperous in their turn. Each generation is entitled to the interest on the natural capital, but the principal should be handed on unimpaired.

The subordination of the consideration of the welfare of the nation to the pursuit of personal wealth, which is so widespread in the Dominion at the present time, is, it is to be hoped, merely a product of our present phase of development, but it is destructive of all true national life and to the development of a strong and happy people. It is as true now as in past ages that "where there is no vision, the people perish." Over the whole principle of conservation a great moral issue reigns supreme. Its acceptance is a test of national efficiency.

General Statement Concerning the Physical Features and the Natural Resources of Canada.

The area of the Dominion of Canada is about 3,730,000 square miles, which is somewhat greater than that of the United States including Alaska, and rather less than that of Europe.

In Canada, as in every other country of the world, the physical features have played, are playing and will continue to play a most important part in the development of the history of the country and the character of its people.

Looking back into the abyss of past time, we find that part of North America which we now call Canada originally consisted of three widely separated land areas, rising from the waters of the primeval ocean. These areas are sometimes termed the protaxes or primitive axes of North America. I refer to them at the present time because, while the eastern and western protaxes, marking the lines along which our mountain ranges—the Appalachian and Cordilleran Systems—were subsequently developed, became more or less buried beneath the blanket of sediments which filled in this early outline of the continent, the great northern protaxis, composed of the hard granite and crystalline schists of that ancient time, has remained exposed to the present day. Its enormous expanse of 2,000,000 square miles represents more than half the whole area of the Dominion of Canada. It forms a rugged and, for the most part, barren tract, which, driven down like a wedge into southern Canada, separates the older settlements of eastern Canada from the new provinces of our West. It cuts Canada in two and has in this way exerted a most potent and in some respects a sinister influence on the development of our Dominion. The cost entailed in building the line of the Canadian Pacific railway across this barren tract of country for the purpose of uniting eastern and western Canada was enormous, and few better examples of the influence of the physical features of a country upon its development and history can be cited than that of this ancient protaxis upon the development and history of Canada.* It will be noted that this northern protaxis, or "Canadian shield," as it has been called by the great Austrian geologist Suess, barely passes south of the Canadian boundary line. The problems which it presents in Canada are, therefore, non-existent in the United States.

*This was noted as far back as 1863 by Captain Palliser in his Report on *The Exploration of that Part of British North America between the British Boundary Line and the Height-of-Land of the Northern Ocean*, presented to the House of Parliament on May 19 of that year. He wrote:

"The general aspect of the northern shore of lake Superior is precipitous and rugged. Around Thunder bay, however, and extending for some distance up the valley of the Kaministikwia, there is a considerable extent of rich alluvial land, heavily timbered. The rise to the crest of the rocky district that forms the height-of-land is almost abrupt, to an altitude of 800 feet above lake Superior, or 1,400 feet above the sea level.

"The country which succeeds to the west and north is wild and rocky, but with no hill more than 300 feet above the general level, so that it cannot be called a mountainous region. It is inter-

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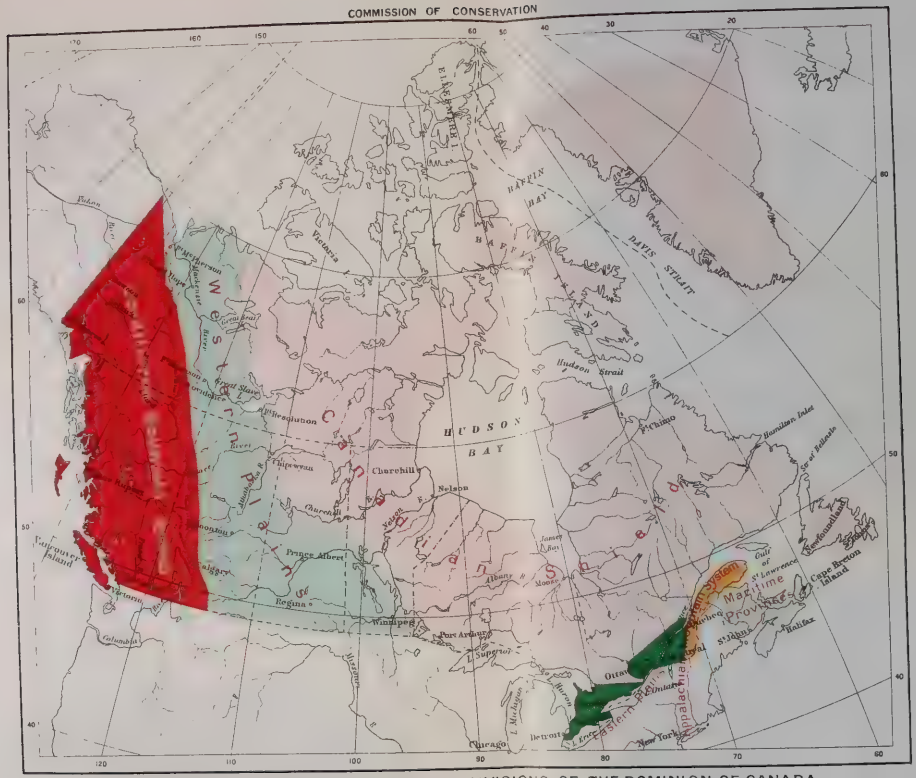


MAP SHOWING GENERAL PHYSIOGRAPHIC DIVISIONS OF THE DOMINION OF CANADA

Canada falls naturally into the following physiographic divisions:

The Canadian Shield, to which reference has just been made, is a great plateau with an average elevation of about 1,500 feet above sea level. A somewhat undulating, rocky country, in the south well wooded but containing little farming land. It, however, contains important mineral deposits.

The Appalachian Mountain System, represented in Canada by the Notre Dame and Shickshock mountains, which crosses the boundary line from New Hampshire and runs in a curving north-easterly course through the province of Quebec to the extremity of the Gaspe peninsula.

The Area of the Maritime Provinces. This lies to the east of the Appalachian Mountain system—a diversified tract of country containing considerable areas of good farming land and with important coal deposits.

The Great Plain of Central Canada. This lies along the southern margin of "the Canadian shield," and stretches from the Appalachian mountains on the east to the Rocky mountains on the west. It is, however, interrupted in the region of the Great lakes by the southern extension of "the Canadian shield," which separates the eastern portion situated in the provinces of Quebec and Ontario, and which may be termed the Eastern plain, from the much larger portion which forms the provinces of Manitoba, Saskatchewan and eastern Alberta, and which is known as the Western plain. It contains the greater part of the farming land of the Dominion.

The Cordilleran Mountain System, of which the Rocky mountains are the eastern range. This system of mountain ranges, with its intervening valleys and plateau land, bounds Canada on the west and embraces British Columbia and western Alberta. It has the finest surviving forests of the Dominion and is rich in minerals. It contains,

---

sected by long narrow lakes and innumerable water-courses, broken by ridges of rock, across which the traveller has to make tedious portages. The extent of the continuous water communication improves considerably as we descend to the west, and there are some large lakes which would be available for steam navigation in the event of the country ever becoming settled.

"As a line of communication with the Red river and the Saskatchewan prairies, the canoe route from lake Superior to lake Winnipeg, even if modified and greatly improved by a large outlay of capital, would, I consider, be always too arduous and expensive a route of transport for emigrants, and never be used for the introduction of stock, both from the broken nature of the country passed through, and also from the very small extent of available pasture. I, therefore, cannot recommend the Imperial Government to countenance or lend support to any scheme for constructing or, it may be said, forcing a thoroughfare by this line of route by land or water, as there would be no immediate advantage commensurate with the required sacrifice of capital; nor can I advise such heavy expenditure as would necessarily attend the construction of any exclusively British line of road between Canada and the Red River settlement.

"As regards the fitness for settlement of the district traversed by the canoe route, I beg to state that there are only very few and isolated spots where agriculture could be carried on, and that only by the discovery of mineral wealth would this region be likely to attract settlers. At present, the considerable number of Indians living in it subsist by hunting, fishing, trapping and trading furs to the Hudson Bay Company; but the fitness of the country for these pursuits is by no means a proof of its being so for those of civilized man."

however, only a relatively small amount of farming land which can be cultivated without irrigation.

The natural resources of the Dominion on which the population of Canada must depend for their support are six in number:

1. Agriculture and the cattle trade.
2. Forest products, timber, pulp-wood, etc.
3. Water-powers.
4. Products of the mines.
5. Fisheries.
6. Fur trade.

Speaking generally, our manufactures and transportation systems are dependent upon these and, therefore, stand or fall with them.

The relative importance of these several sources of national wealth, as expressed in the monetary value of their respective products, is shown in the accompanying table. The figures are obtained from the government returns for 1913.

In the table there is also given, for purposes of comparison, the value of the exports of each of these national products.

These figures, given in the following table, are set forth in graphic form in the accompanying diagram.

	Output in Dollars	Exports in Dollars
Agriculture (including dairy products and cattle)	673,771,500*	194,930,254
Forests (1912)	182,300,000	43,255,060
Mines	144,031,047	57,442,546
Fisheries	33,389,461	16,336,721
Furs	.....	5,415,118

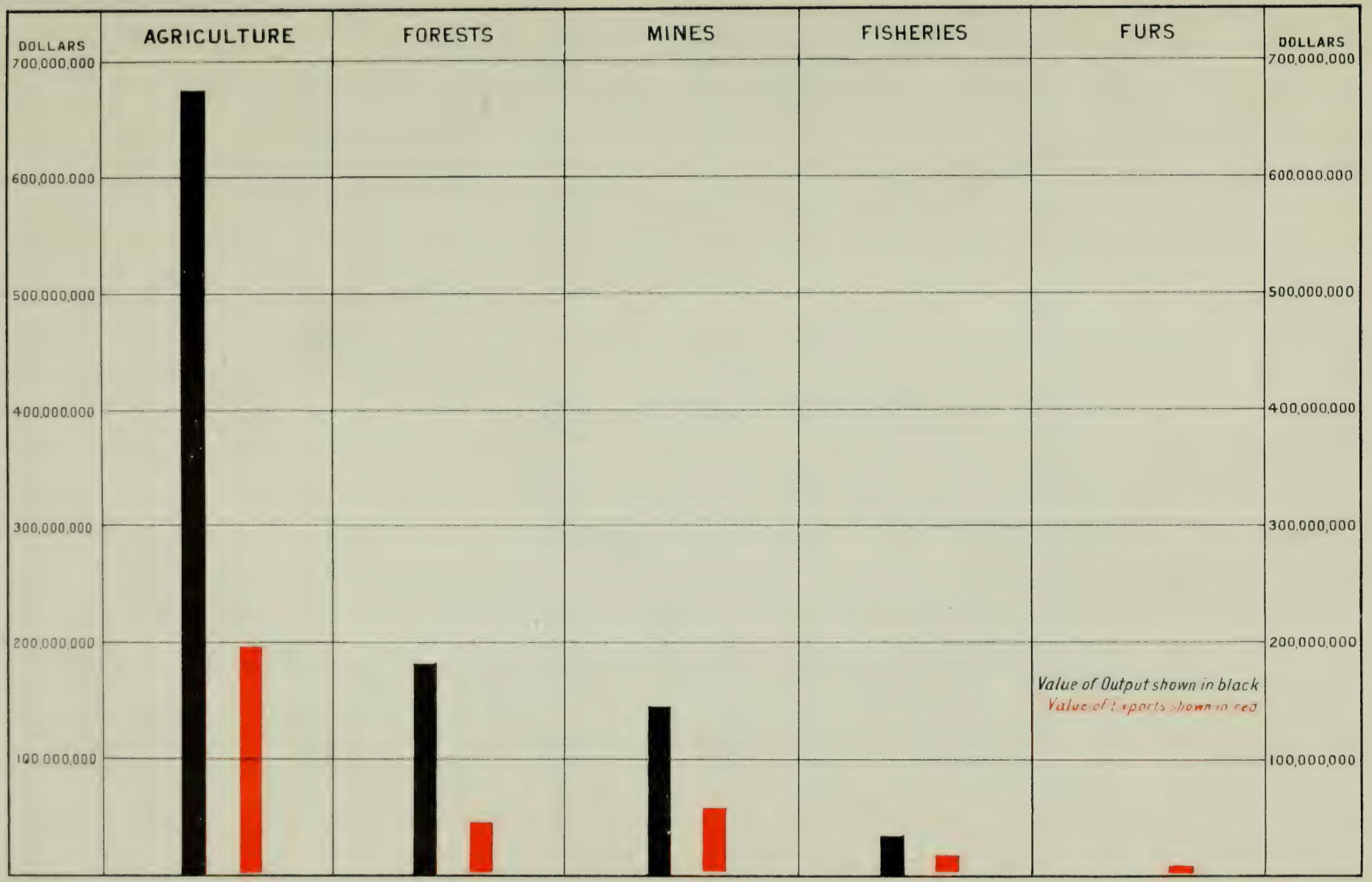
Let us look briefly at the extent and the present status of the development of each of these great sources of national wealth in the Dominion.

Agriculture

Agriculture is and must always remain the chief industry of the people of Canada. The population which the Dominion can support in the future will depend chiefly upon the area of land suitable for farming which exists in Canada and the manner in which this is cultivated.

The fact that Canada occupies more than half of the continent of North America and has an area almost identical with that of Europe

*This does not include cattle, no returns for these being made to the Government, except in exports.



VALUE OF OUTPUT AND EXPORTS OF CANADIAN INDUSTRIES IN THE YEAR 1913

is sometimes mentioned as carrying with it the implication that it would afford support to an almost unlimited population.

It is impossible at the present time to arrive at an accurate estimate of the actual area of arable land in the Dominion, but there are certain salient facts which, while not generally recognized, have a very important bearing on this question.

The first of these is that there is practically no land which can be properly cultivated in that portion of Canada which lies north of the area indicated on the accompanying map as being covered by a forest growth.

Secondly, with the possible exception of the clay belt in northern Ontario, there is no part of "the Canadian shield" which can support more than a very sparse farming population or in which farming can be made a really profitable industry. The recent report of the Commission of Conservation on the condition of the farming community on the southern margin of "the shield"—on the watershed of the Trent canal in southern Ontario, shows a state of affairs long recognized by those familiar with the Laurentian country.

Thirdly, the area of arable land in British Columbia, as compared with the size of the province, is quite small.

There are only two great areas of land capable of continuous cultivation throughout their entire extent and of thus supporting a large agricultural population. The first of these is the plain lying between the southern margin of "the Canadian shield" and the boundary line of the United States, in Quebec and Ontario, extending from the hilly or mountainous district of the Appalachian folding in eastern Quebec to the Great lakes. The second is the southern portion of the plains in the provinces of Manitoba, Saskatchewan and eastern Alberta. These, in referring to the physiographic divisions of Canada, were classed together as the Great Plain of Central Canada.

Many of the estimates which have been made of the amount of land which is suitable for farming in the Dominion are undoubtedly too high. A recent writer has stated that "a conservative and easily grasped statement is that the farm lands of Canada would fill a strip of country the width of France and 3,000 miles long." Canada is 3,000 miles across from ocean to ocean and France 400 miles wide. This would give to the farming land of the Dominion an area of 1,200,000 square miles. If anyone who is well acquainted with Canada will draw a line parallel to the southern boundary of Canada but 400 miles distant from it, he will find that there is not very much farming land to the north of this line, while there are vast tracts of country on which

we would be very sorry to be obliged to engage in farming to the south of it.

Another authority states that the area of land which is used for farming and grazing purposes in the Dominion at the present time may be set down at 50,000,000 acres and that a conservative estimate would make the area available for these purposes six times as great, that is to say, 300,000,000 acres or about 470,000 square miles. This smaller estimate, which includes not only farming but grazing land, is probably too low but nearer the truth.

We do not require, however, to resort to exaggeration to convey an adequate impression of our immense wealth in agricultural lands. We certainly have in Canada abundant land to support a population of many millions—a people who will be not only numerous but who should have that sturdy manhood which has always characterized the populations of northern countries.

If, however, this great heritage is to be transmitted unimpaired to succeeding generations of Canadians, we must improve our methods of farming and follow the example set by other countries from whom we have now much to learn. Good land will support a dense population and can be made to do so without losing its fertility, but only by intelligent and intensive cultivation. The greatest farming community in the world is that which lives on the rich delta lands of central and southern China. Prof. King, of the University of Wisconsin, who, when in China made an exhaustive study of the methods of farming there adopted, has reported that these people have, during the long series of centuries in which they have tilled the land, developed such a perfect system of agriculture that he could see no way in which western science could materially aid them. Through these long ages, while they made the land yield enormous crops, they have maintained its fertility.

But what has been the experience of the United States, which is our nearest neighbour and the one whose fields are contiguous with ours? If we take the wheat crop, using it merely as an index of yield, we find that large crops of this grain used to be grown in the east. A recent bulletin of the United States Federal Department of Agriculture tells us that "Wheat was successfully produced in central New York for something like 40 years. During the latter part of that period the yield began to decline, and at the end of another 20 years it was so low that exclusive wheat growing became unprofitable. Ohio, Indiana, Illinois and Iowa have each in turn repeated the history of New York. The soils of these states were productive in the beginning,

Drifting sand advancing over cultivated land, Lachute, Que.

A common western method of disposing of stable manure. This method will not maintain the fertility of the soil nor will it increase the regard of posterity for those who practise it.

PLATE B.

and it required 40, 50 or 60 years for the single crop system to materially reduce the yields."

Now in the east we find in many regions abandoned farms with farm houses in every stage of decay. The average yield of wheat in New York state as recently as 1898 was 21.2 bushels per acre; in 1907, it was 17.3 bushels. In the same short time the average yield in Indiana fell from 15.6 to 14.4 bushels; in Minnesota from 15.8 to 13 bushels; in North Dakota from 14.4 to 10 bushels; in Oklahoma from 14.9 to 9 bushels.

As has been remarked by Mr. Hill, "instead of preserving the fertility of their lands, the farmers have gone in search of new soils to be skinned, robbed and abandoned as soon as the old showed signs of exhaustion. Now that they have reached the jumping-off place, there is no longer any 'West' to move on to."* The direct interest which this has for us lies in the fact that there being no more "West" to move into, the stream has turned north and is now moving into the Canadian Northwest. We have here an illustration of the truth of Lord Bacon's observation that "The principal thing that hath been the destruction of most plantations hath been the base and hasty drawing of profit in the first years."

The Committee on Lands of the Canadian Commission of Conservation, under the able chairmanship of Dr. J. W. Robertson, is now carrying on an agricultural survey of the Dominion. They visited and examined, in 1912, 1212 farms in the several provinces of the Dominion, and while in the eastern provinces, speaking generally, from 25 to 50 per cent of the farmers showed an increase in the yield of their farms during the past 10 years, of the 100 farms examined in Manitoba not one farmer reported an increase in the yield per acre and 46 per cent reported an actual decrease. This decrease, as Dr. Robertson remarks, must be concurrent with exhaustion of fertility.†

This decline in fertility with impoverishment and impending exhaustion of the soil is due, of course, to the growing of a single crop or to other bad practices in farming.

The land on the western prairies and many other parts of Canada and the United States is at the present time being mined, not farmed. In Manitoba, the deep black soil is very rich and is being exhausted slowly, but the lighter land of Saskatchewan and eastern Alberta will be impoverished more quickly, and the more rapidly the population pours into this western country, the more rapidly will this result be attained. The progressive exhaustion of the lands of the western

*_Highways of Progress_, p. 78.

†_Annual Report, Commission of Conservation_, 1912, p. 59.

provinces under wheat cropping is probably the greatest problem in conservation which faces the Canadian people at the present time.

It is only by cultivating an amount of land which they can care for properly, by adopting a proper system of rotation of crops and by applying to the land suitable manures, either natural or artificial, that the fertility of our lands can be maintained by the farmers.

In view of these facts, it is a matter for sincere congratulation that in parts of Manitoba and Alberta, as well as in our eastern Provinces, more attention, within the past few years, is being given to mixed farming.

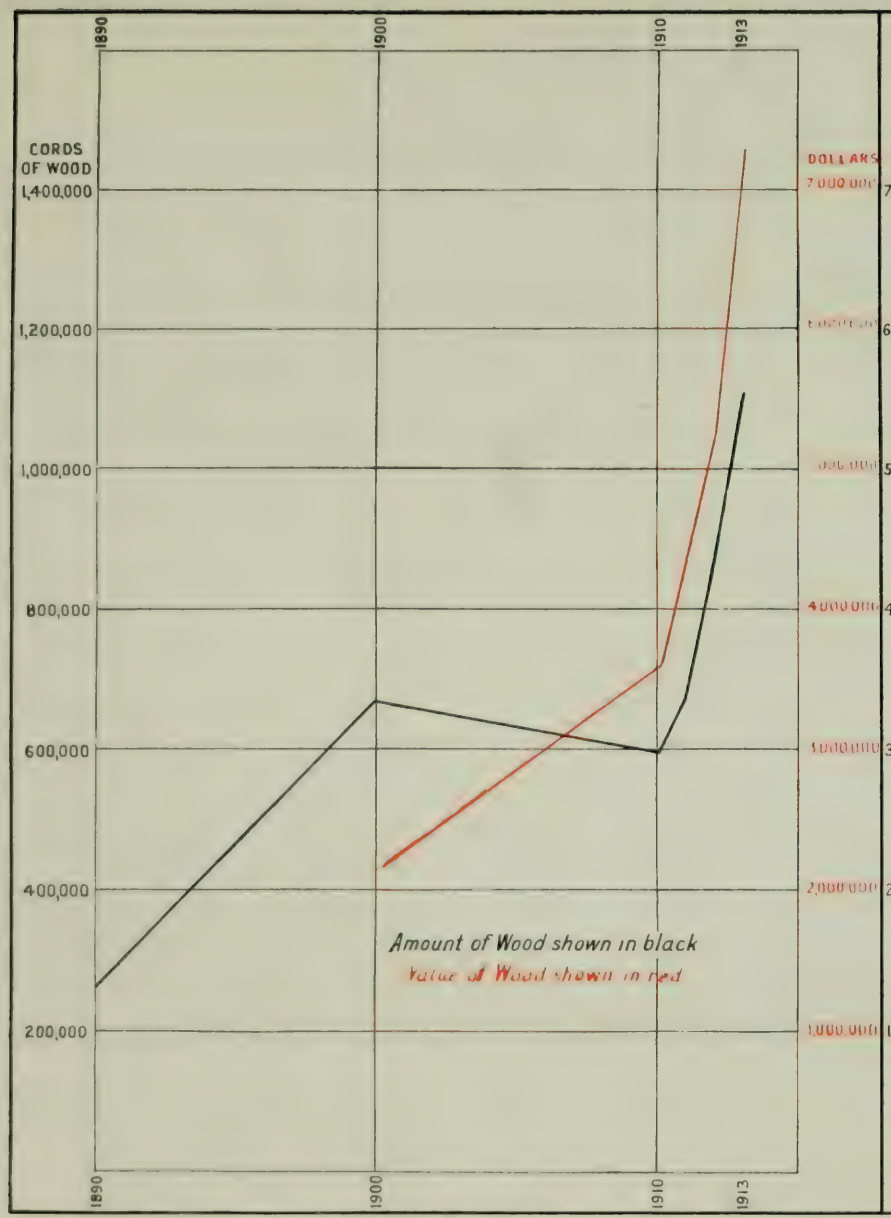
It is to be noted as a favourable sign that within the past two years serious attention is being paid to the raising of hogs, 100,000 of these animals having this year been shipped to the United States in addition to those sent to the Canadian factories. Every possible effort, however, should be made to carry instruction to the farmer and to demonstrate to him the importance of caring for his land. Something is now being done in this direction by our agricultural colleges and by the Commission of Conservation, and much has been done by the Federal Government through the Department of Agriculture. It is to be hoped that the great grant of $10,000,000 now being expended by the Government for the advancement of agriculture in the Dominion may, in part at least, be applied to the education of our farming population in the underlying and everlasting principles on which a sound system of agriculture is based.

Forest Products, (Timber, Pulpwood, etc.)

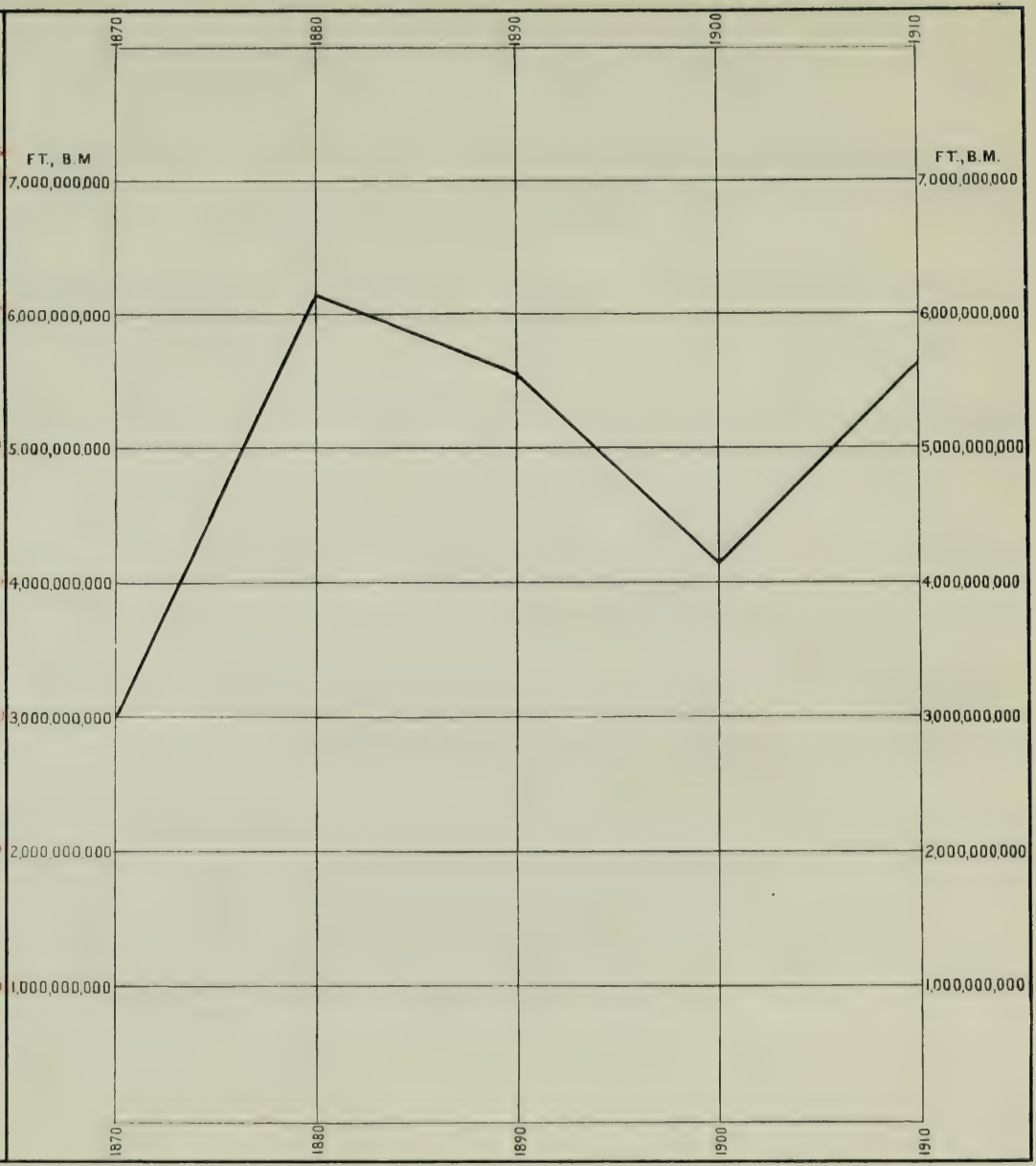
The forests of Canada were its chief source of revenue in the early days of the settlement of the country. Year by year great rafts of timber were floated down the St. Lawrence and Ottawa rivers past Montreal and were loaded on fleets of ships at the port of Quebec. Later, with the advent of railways, the same lumber was brought in immense quantities by rail to Montreal or shipped directly to its market in the United States.

The following figures, represented graphically in the accompanying diagram, show the yield of products of the forest (wood) annually for census years going back to 1870, expressed in feet board measure:—

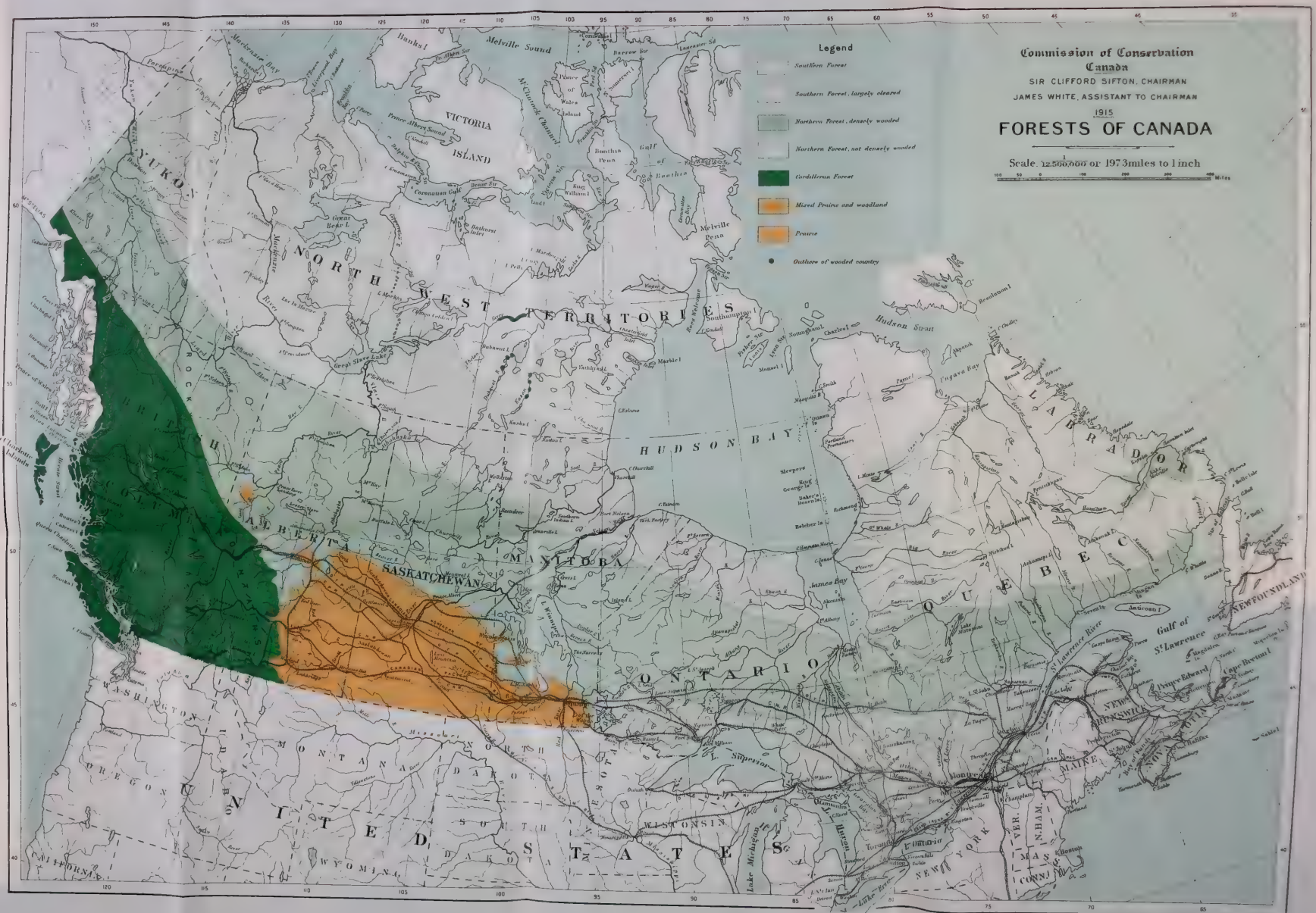
	Feet Board Measure
1870	2,951,134,352
1880	6,174,605,544
1890	5,529,993,716
1900	4,131,702,968
1910	5,696,537,260



AMOUNT AND VALUE OF THE WOOD ANNUALLY MANUFACTURED INTO PULP IN THE DOMINION OF CANADA



TOTAL OUTPUT OF FOREST PRODUCTS IN THE DOMINION OF CANADA



Base map from plate of Dept of Interior map

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These figures have been compiled for me from the census returns by Mr. Leavitt, the Chief Forester of the Commission of Conservation. They comprise the output of square, waney and flat timber, logs for lumber and pulp wood. Such products as cord-wood and fence posts are not included owing to the fact that the statistics for these must necessarily be very largely conjectural, and also owing to the fact that for purposes of comparison their inclusion would be unsatisfactory in so much as no figures whatsoever are given for such products prior to the census of 1891.

Notwithstanding this continuous drain upon our forests and the tremendous losses which they have sustained by fire, the general opinion of the people of Canada, an opinion to which from time to time expression is given in the utterances of our public men, is that the great northern forests of Canada are so extensive that they are practically exhaustless and will afford an abundant supply of timber for all future time, a supply which will not only meet our own needs, but will be amply sufficient to make good the increasing demand of the United States, due to the disappearance of its own forests, and also afford a surplus for export to Great Britain, South America, the West Indies and other countries as at the present time.

A closer examination of the facts of the case, obtained by investigations carried on during recent years, however, reveals a number of interesting and very important results.

The accompanying map, based upon one prepared in 1906 by Mr. James White, the Dominion geographer, shows the nature and extent of the forests of Canada.

It is only in these portions of the Dominion which on this map are shown to be covered by the "southern forest;" the "northern forest, densely wooded;" and in British Columbia, that there are forests yielding merchantable products. Furthermore, it must be noted that the "northern forest" is composed chiefly of trees of less value than the "southern forest," which has up to the present time been the chief source of the timber supplies of eastern Canada.

A careful study of the question by the official forester of the Dominion shows, furthermore, that so far from being exhaustless the reserves of merchantable soft timber in the forests of Canada are only between one-fourth and one-fifth of that remaining in the forests of the United States. Of these reserves in Canada, about one-half are in the old provinces of eastern Canada and the other half in British Columbia. The evidence goes to show that at the present rate of cutting, the supply of timber will within a comparatively few years be

sufficient only for the needs of the Dominion itself, leaving no surplus for export.

A forest survey of the province of Nova Scotia, by Dr. Fernow, has shown that in that province, if the saw mills which are now at work continue in operation with their present output, the merchantable timber will be entirely exhausted in the next 20 years.

In 1895, the Dominion statistician stated in his report that "the first quality of pine had disappeared" and that "we are within reasonable distance of the time when, with the exception of spruce as to wood and British Columbia as to provinces, Canada shall cease to be, as now, an exporting country."

It must be borne in mind that while a large part of Canada is covered with forest, much of this is a woodland country rather than a country covered with a forest which produces considerable supplies of merchantable timber. Furthermore, the practice which has been followed of cutting out the valuable kinds of timber, has left the successively poorer and inferior species of trees—"tree weeds," as they have been called—to multiply without restraint, and thus the forest gradually changes its character and deteriorates in value. Moreover, the rivers draining the northern forest flow down to Hudson bay, so that the logs if floated down the streams would reach that body of water instead of the St. Lawrence or the Great lakes.

With the approaching exhaustion of the reserves of standing timber, there has sprung up within the past few years a demand for pulp-wood, to supply which the younger and smaller trees are taken and ground up for the manufacture of paper. Fortunately this is not necessarily so fatal to the continued existence of our forests as might be supposed, for the younger trees, if properly cared for, grow in a relatively few years to the size required for pulp-wood; thus, while the rate of growth varies greatly in different places and under different conditions, it may be said, speaking generally, that if it takes 120 years for a spruce tree to grow to a diameter of 12 inches, when it will yield saw logs, the same tree, under similar conditions, will in about 50 years grow to a diameter of six inches, which is sufficiently large to be used as pulp-wood. Thus, if the limits over which a company cuts its supplies are large and properly cared for, they can be made to produce a continuous supply of wood for the pulp mill. Our great water-powers adjacent to this supply of raw material should make this pulp and paper industry a permanent source of wealth to the Dominion. The growth of the pulp industry in Canada is set forth in the following table and is shown graphically in the accompanying diagram. In

Nursery of young Norway Spruce for re-planting deforested areas, Saranac Lake, Adirondack Mountains. (From Forestry Branch, Department of the Interior, Canada.)

Burned area replanted with young trees. Saranac Lake, Adirondack Mountains. (From Forestry Branch, Department of the Interior, Canada.)

PLATE C.

addition to the wood used in Canada, a very large amount is shipped to the United States and there manufactured into pulp.

AMOUNT AND VALUE OF THE WOOD MANUFACTURED INTO PULP IN THE DOMINION OF CANADA, AND THE AMOUNT OF PULP PRODUCED FROM IT

	Cords of Wood used	Value of Wood in dollars	Tons of Pulp produced
1890.....	261,110	.....	.....
1900.....	668,034	$2,168,509	.....
1910.....	598,487	$3,585,154	474,000
1911.....	672,288	$4,338,024	496,833
1912.....	866,042	$5,215,582	682,632
1913.....	1,109,034	$7,243,368	.....

Our forests are not inexhaustible. They have already been much injured and the eastern forests are now greatly depleted, and their condition is becoming worse year by year.

Such being the situation, is it not possible to adopt some course of action which will conserve our forests and make them a permanent source of industry and wealth for succeeding generations?

In the first place, we must recognize that the conservation of our forests does not mean that they shall be locked up. We must all agree with Dr. J. W. Robertson when he says: "I have no sympathy with people who would reserve our forests for our descendants. Conservation means taking the largest toll out of these revenues now and leaving them not only unimpaired but extended and improved by wise use, using the annual production, but not destroying or reducing the source of supply."

Let us see what other nations have done with their forests. The facts concerning these have been admirably presented by Dr. Fernow in his *History of Forestry*. I cite a few of them, giving only the financial results, seeing that the objection generally urged to the proper care and preservation of our forests in Canada is that it would not pay.

The Prussian forests—which were once in a condition as bad as ours—in 1830, when systematic management had been applied only for a short time, yielded a net revenue of 44 cents per acre; this, by the careful cultivation of the forests, had grown by 1907 to $2.52 per acre, that is to say, there was an improvement in net results annually of

2¼ per cent compounded, while the principal—the forest—was continually improving. Thus Prussia, from an acreage which is about one-half of the area now under license in Ontario, derives annually at least seven times the net income obtained from the forests of Ontario and that not by depleting its capital as Ontario does, but merely taking the interest in annual growth; moreover, the capital is continually increasing in value.

In Saxony, with somewhat less than half a million acres of state forest—mostly spruce—but most intensively managed, the net revenue has increased from 62 cents to six dollars per acre, this state in the last 50 years having taken from its small forest area, wood and wood products to the value of $200,000,000 without impairing its producing value.

France has in the last 60 years reclaimed 2,300,000 acres of absolutely waste land, by forest planting, at an outlay of $15,000,000. These areas are now estimated to have a value of $135,000,000 and furnish annual crops which sell for $10,000,000, a yield of 67 per cent per annum on the initial outlay.

One country after another in Europe has come to recognize the necessity of substituting proper management of its forests for ruthless exploitation, the last to fall into line being Sweden and Russia, the net income derived by the latter country from the 300,000,000 acres of state forest which are actually worked being about $30,000,000 per annum.

The revenue from the forests of British India under the administration of the Indian Forest Service amounted last year to $14,000,000. Over one and a quarter million dollars were derived from the sale of minor produce other than timber and a similar amount was obtained by leasing grazing privileges in these forests.

In the United States also there is now a regularly established forest service with great government forest reserves. These are being increased from time to time. At the close of Mr. Roosevelt's administration, they had an area of 175,000,000 acres. In 1910, the government set aside the sum of $10,000,000 to purchase additional forest reserves in the White mountains and in the southern Appalachians.

In most of the European countries and in India the forests are owned in part by the state, in part by municipalities or communes and in part by private persons. The forests owned by the different German states represent about 33 per cent of the total forest areas, while in Russia the Government owns 62 per cent and in Sweden 35 per cent of the forests. Speaking generally, it is found that the state-

owned forests are the best, the most efficiently managed and most productive.

State ownership is the most suitable for forests owing to the long time—60 to 120 years—which is required to bring the depleted forest into a permanently productive condition. This naturally discourages private enterprise. Since most of the forests in Canada are owned by the Governments, it should be a comparatively easy matter to change our present methods of dealing with these great sources of national wealth and replace them by much more efficient ones. Only two reasons for hesitation can be put forward—firstly, that any change may interfere with private operations, and, secondly, that the expense entailed would be very great.

In reply to these objections it may be said that there are now enormous areas of land standing waste, that is to say, they are either destitute of trees or growing trees which are of no value. If the Governments were to secure certain of these areas and establish forests on them by following the well known principles of forest practice worked out and proved to be so efficient and effective in every country in Europe, they would not only be establishing a profitable investment for public funds, but would present to private owners a striking example of what can be accomplished by the application of knowledge to industry. We are assured by a forester of no less experience than Dr. Fernow, that with the present stumpage of white pine in Canada, the cost of planting can be covered and a return of at least four per cent compound interest would be obtained, while other kinds of wood are also fast reaching a value which would well repay the cost of reproduction.

Such forests of choice pine or other woods would, 75 years hence, be of enormous value both as a source of revenue to the Government and of wood supply to the people of the country.

But in addition to supplying timber, the forests of a country play two other very important rôles: namely, that of equalizing the flow of rivers and of preserving the land itself from being washed away in times of heavy rain.

Beneath the trees of a forest a thick mantle of leaves and twigs covers the ground. These rest upon humus produced by the decay of leaves which have fallen in former years and which is very porous. This material, sheltered from the sun in the shadow of the forest, is like a sponge which is capable of absorbing several inches of rainfall, which is allowed to escape only very gradually.

When, therefore, the forest cover is preserved on the gathering ground or catchment-basin of rivers, the rain falling on this forest

area drains away very slowly into the brooks and streams, which tends in a very marked manner to equalize the flow of the rivers and to lessen the danger of floods.

In the deserts of Arizona, where the forest cover is wanting, within twenty minutes of the first muttering of the thunder presaging a sudden cloud-burst, the rain falling on the surface and draining off immediately into one of the tributaries of the Colorado river, will change this from a narrow stream into a raging torrent thirty or forty feet deep, filling the canon from wall to wall, and the stream, after remaining in flood for a short time, will subside again with equal rapidity. This is merely a rather striking illustration of the fact that the lack of forest cover on the drainage area of a river causes the river to run with a very uneven discharge, at one time in violent flood and at another with greatly reduced volume. This leads not only to great destruction by floods in the lower reaches of the stream at certain seasons of the year, but it greatly decreases the value of the water-powers along the course of the river, since the number of horse-power which can be utilized in the case of any power development is that which can be supplied continuously throughout the year, that is to say, speaking generally, the amount of power supplied by the stream at low water. Our water-powers in Canada are so numerous and so valuable that anything which tends to destroy them must be regarded as a national peril.

To protect some of our more important streams, the Dominion and Provincial Governments have set aside certain large areas about their head waters as permanent forest reserves or national parks. These areas, in recent years, have been greatly increased on the recommendation of the Commission of Conservation. The total area of the Dominion forest reserves at the present time is 35,804 square miles and the total area of national parks in Canada is 4,114.25 square miles. In the forest reserves no land can be taken up for settlement, and the forest cover will be permanently preserved, while in the national parks the game is also preserved, so that they become sanctuaries for the wild animals of the country. One of the most important of these forest reserves is that on the eastern slopes of the Rocky mountains in Alberta, which will not only protect the catchment areas of the rivers flowing through the great plains but will also supply timber to the future population of this great district.

This action of the Government is worthy of all commendation. Other reserves should be added to those which have been already set aside, as, for instance, the tract about the head waters of the Winnipeg

river recently recommended by the Commission of Conservation, the area being one which is unfit for settlement, but of great importance in connection with the equalization of the flow of this river on which such enormous water-powers are now being developed and which have such an important bearing on the welfare and future of the province of Manitoba.

It is, however, of the utmost importance that the Government should be supported by a strong public opinion in providing a really effective administration of these great reserves, so that the laws enacted for their maintenance shall be properly enforced.

Again, areas from which the forest cover has been removed, leaving the soil exposed—especially if they be on hill or mountain sides—are often reduced to perpetual barrenness by the washing away of the soil, leaving exposed the bare rock beneath on which there is no foothold for vegetation. Whole districts on the western slopes of the French Alps have been devastated in this way and the population forced to leave, their farms having entirely disappeared.

Widespread devastation from this cause is also seen in China, where the wood cutters, in search of fuel for the dense population of that teeming land, in past ages completely stripped the forest cover from the hill slopes over great areas which are now deserts.

This destructive process is going forward very rapidly in the southern Appalachian region of the United States. The Secretary of Agriculture of the United States has stated that in 1901 the damage wrought in this region from this cause amounted to $18,000,000, and Governor Glen in his address to the White House Conference in 1908 stated that the loss, year in and year out, might be estimated at from seven to eight million dollars.

Prof. Shaler says that a field lying at an angle of twenty degrees can be totally destroyed, having all the soil washed off, after a hundred ploughings, and he estimates that in Kentucky, where cultivation is hardly more than a century old, one-tenth of the arable soil has been destroyed and that a considerable portion of this cannot be restored in any way.

This danger is especially threatening on the steep mountain slopes in British Columbia, where the soil, if stripped of its forest cover by the axe or by fire, will be exposed to the same processes of destruction.

Fortunately an interest in the preservation of our forests is being awakened in Canada and certain steps are being taken toward this end. One of the most widespread causes of destruction has been forest fires. The railroads have been a very active agency in starting such fires; so much so that the Railway Commission has made a regulation, govern-

ing all the roads under its control, to the effect that the roads are responsible for any forest fires started by their trains in the districts through which they run and that any fire started or burning within 300 feet of their tracks will be considered as having been originated by their trains. This has led to a very careful patrol of the railway lines, especially where these run through forest lands, as for instance in Alberta and British Columbia. The locomotives running over some 587 miles of the Canadian Pacific railway in British Columbia have been equipped to burn oil instead of coal, which greatly reduces the danger of starting fires in the adjacent forests. All the railways have made provision by appointing special officers to carry out the orders of the Board of Railway Commissioners of Canada, and to co-operate with the officers of that body and those of the federal and provincial forest departments.

In British Columbia a survey of the forest lands is in progress and lands desired for settlement must be examined by the Forest Board and declared suitable for settlement before any grant is issued. The timber lessees pay a certain tax per acre to which the Government adds an equal amount, and these payments constitute a fire protection fund, with which, during the year 1913, 415 fire rangers were employed in addition to 60 engaged by the railways. Many miles of road and fire lines were cut through the forests, and look-out stations, as well as 529 miles of telephone line, for the fire protection service, were constructed.

More or less effective steps are also being taken by other provinces looking to the protection of their forests from fire.

One of the most important developments in connection with forest conservation is the establishment of the St. Maurice Forest Protection Association, formed in 1912, when the companies holding timber and pulp-wood limits in this valley, recognizing that individual effort was quite inefficient, combined and organized their fire protection work into one service, placing it under an officer who should have exclusive charge of this important work. The Association has now charge of an area embracing 7,279,000 acres. It has made the whole of this area accessible to its fire rangers by cutting out over 500 miles of trails and has connected all its stations by telephone. As a result, during the first year of its operations, no less than 97 incipient fires were extinguished and no loss was incurred, while in the summer of 1913, which was exceptionally dry, 306 fires were extinguished, the actual fire damage amounting to less than one-thousandth of one per cent of the value of the timber on the territory patrolled. More recently, the Lower Ottawa Forest Protective Association, Limited, has been organized,

which provides for the proper patrolling of over 6,250,000 acres, or nearly 10,000 square miles of timber lands on the watersheds of the Gatineau, Lievre, Rouge, Coulonge and Nation rivers in the province of Quebec.

The results already obtained by the St. Maurice Forest Protective Association demonstrate, that by the adoption of intelligent co-operation between timber owners and governments, absolute protection against fires can be secured in the normal season. It is hoped that the excellent examples set by these associations will be followed in all parts of the Dominion.

Other undertakings on a smaller scale which are being set on foot in various provinces of the Dominion afford an indication that the importance of preserving our forests is being realized by the people of Canada. The development of a strong public opinion supporting the Government in the appointment of properly qualified and thoroughly efficient persons to enforce existing Government regulations is the most important factor required in the meantime to give to our forests the important place which they should have among the permanent assets of the people of Canada.

Water-powers

One of the natural assets of the Dominion whose importance was not recognized until comparatively recent years is her water-powers. It is, in fact, an asset which formerly had but little actual value. A large waterfall if situated near some centre of population or in some place which was of convenient access, was of value as a source of power for the operation of one or more mills, but its value was purely local. Even the finest water-powers situated in remote or inaccessible districts were of interest as spectacular displays of vast power and marvellous beauty, but were otherwise of no benefit to mankind.

With the discovery, however, of the possibility of converting this power into electrical energy and transmitting it for great distances, all great water-powers, which were not too remote from centres of population, became available and this new source of power is now being drawn upon and applied to meet human needs to an ever-increasing extent and with an ever-widening range of application.

It is doubtful if there is any country in the world which is so abundantly supplied with water-powers as the Dominion of Canada. In the central portion of the Dominion "the Canadian shield," to which reference has already been made, possesses an area of two million square miles and has an average elevation of about 1,500 feet above sea level. All the rain falling over this enormous area, which is not lost by evaporation, drains off in countless brooks and streams

which, uniting into rivers, cascade down the slopes of this highland to the sea, in countless waterfalls, many of them of great size. And on either side of the Dominion there are ranges of mountains or of mountainous country whose drainage in a similar way gives rise to waterfalls.

The total water-power represented by these many streams or which is available for use cannot yet be calculated, but it is enormous. The following table, however, gives the number of horse-power which had been developed from the water-powers in our several provinces in the year 1911. This will of course be immensely increased as years go on.

	Horse-power
Ontario	532,266
Quebec	300,153
Nova Scotia	15,272
New Brunswick	9,765
Prince Edward Island	500
Manitoba	48,300
Saskatchewan	45
Alberta	7,300
British Columbia	100,920
Yukon	2,000
Total for Canada	1,016,521

Long distance transmission of power by electricity dates from the year 1882, when Marcel Deprez, at the Munich Electrical Exhibition, transmitted about one horse-power a distance of 35 miles to a place called Wiesbach. So marked, however, are the advances which have been made in the science of electricity since that time that it is now possible to carry the energy developed by our water-powers for very great distances. The Pacific Light and Power Company of Los Angeles, California, is now transmitting over 100,000 horse-power for a distance of 240 miles. The Hydro-Electric Power Commission of Ontario is transmitting power a somewhat greater distance—242 miles—from Niagara Falls to Windsor. If power is carried for a radius of only a hundred miles from any centre, it serves an area of over 31,400 square miles. If it be carried for a radius of 240 miles, it covers an area of rather over 180,000 square miles, or somewhat less than half the area of the province of Ontario. A water-power of sufficient magnitude can thus be made available to millions of people.

Practically every city and town in the provinces of Quebec, Ontario, Manitoba and British Columbia is largely supplied with

light and power generated through hydro-electric development. Quebec city and the surrounding districts obtain their electric current from the Montmorency and Chaudière falls; Montreal and the surrounding districts from the Shawinigan falls, 85 miles away, also from the Lachine rapids, the Richelieu river, the Beauharnois canal; furthermore, a large development on the St. Lawrence river at the Cedar rapids is now in course of construction, with initial development of 100,000 horse-power. Ottawa obtains its power from the Chaudiere falls—large developments are there in existence and extensions are now under construction. The whole of south-western Ontario, including Toronto, obtains its power from Niagara falls. In the West, Winnipeg is amply supplied with hydro-electric power from plants built on the Winnipeg river; Vancouver and the Pacific Coast towns are supplied by large hydro-electric plants—the largest of which is that of the Western Canada Power Company, with a maximum development of nearly 100,000 horse-power.

Not only is electrical energy readily applicable to large installations, but it has the enormous advantage over all others in its capacity for ready subdivision. It may be carried to the small shop, to the barn, to the home. Already, in cities where electrical power is cheap, it is running the sewing machine, cleaning the floors and doing other heavy work of the household. Similarly on the farm it may do much of the heavy work both indoors and outdoors. In certain lines of industries, it may be the means which will keep industry in the small shop instead of concentrating it in the large factory.

Water-power is perhaps unique among the resources of a country in that it is not diminished by use nor conserved by non-use. By using it, however, the drain on the fuel supplies of a country are lessened. It can be shown that it takes five tons of coal to produce energy to the extent of one horse-power per year. So that every horse-power of energy which runs away unused in a waterfall in an inhabited country is equivalent to the depletion of coal resources of this country by five tons annually.

Furthermore, while it is a good and economical steam plant which will utilize ten per cent of the energy of the fuel, the hydro-electric plant can make available as much as 70 per cent of the energy of a waterfall. "It is, I believe, within reason to hope," said Prof. Herdt, of McGill University, in his recent address before the Royal Society of Canada, "that the use of coal for the production of power in our large cities will before long be almost entirely abandoned and that hydro-electric power, economically transmitted and distributed, will in time light every home and drive the machinery of every factory in

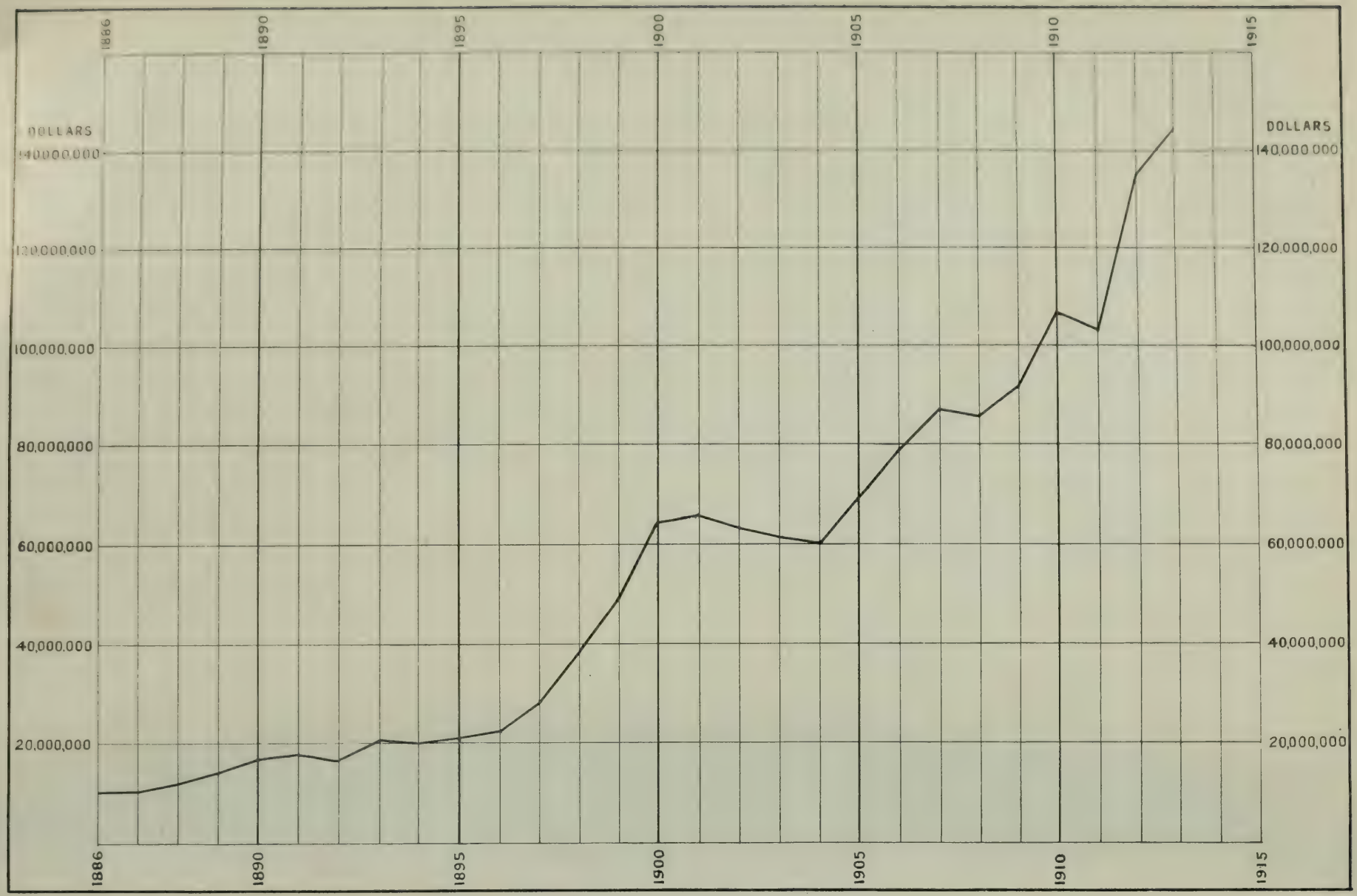
this country. To provide the immense quantity of power required for this purpose, we shall require the surplus waters of our canals, the falls and rapids of the St. Lawrence river and the powers of our great inland waters. These are and will remain among Canada's richest assets, and will be the great source of our future development. The importance of effectively and economically utilizing these water-powers cannot be over-estimated. A definite, comprehensive policy with respect to the nation's vast water-power resources should be formulated. This great asset of the raw material from which the finished product is made by the expenditure of money and brains should not be given away unless the power is developed and placed at the service of the people. Reasonable encouragement, however, should be given to power schemes, bearing in mind that a water-power undeveloped is like unmined gold,—it takes money to place it at man's service. They should be developed in such a way as to render available, in a profitable manner, the energy which is now going to waste, and at the same time conserve for future generations our other natural resources."

Mines and Minerals

Mining is the only industry in a country which from the very nature of the case cannot be permanent. Other industries—like money well invested—can be made to yield an annual return in interest while the capital remains unimpaired or even increases in value.

The mineral wealth of a country may be compared to a sum of money hidden in the ground. It does not renew itself and every dollar abstracted leaves just so much less for future use. "Yet it is a singular fact," as remarked by a recent writer referring to the United States, "that among a people supposedly grounded in the rudiments of political economy, the progressive exhaustion of this precious resource is everywhere heralded as a triumph of enterprise and a gauge of national prosperity. The nation publishes periodically the record of its scattering of assets never to be regained and waits with a smile of complacence for general congratulation."

Great mining regions in the older countries of the world worked for many years have now become exhausted. Among these may be instanced the Kongsberg mines in Norway, which at one time produced great masses of native silver rivalling those now obtained from Cobalt; the lead mines of Great Britain now completely abandoned; the celebrated mines of the region about Freiberg in Saxony worked continuously since 1160, the last of which is now about to be closed down; and the great diamond fields of India, which no longer yield these precious gems.



ANNUAL PRODUCTION OF MINERALS IN CANADA

In recent times, with the introduction of high explosives and modern machinery, the exhaustion of any mineral deposit is much more speedily attained than with the cruder appliances of former times, and while under these modern conditions some of our great mining camps, as, for instance, that of the Sudbury district, will continue to yield an enormous output for many years or perhaps decades yet to come; others, such as the Cobalt district, have already passed their time of maximum yield, and the output, while still very large, is falling off. In the United States, the anthracite supply is approaching exhaustion, which is a fact of portent not only for the people of the United States but also for the people of eastern and central Canada, for all our supplies of this most valuable fuel are drawn from the mines of Pennsylvania.

The discovery and development of mining regions, however, even although these must be exhausted in time, is often of the greatest importance to a community, and in the earlier stages of its development bring about the opening up and settlement of remote tracts of country which subsequently develop other industries.

In Canada, our mineral deposits are of great extent and importance. The mineral output is increasing very rapidly year by year as shown in the accompanying diagram, and in the year 1913 had a value of $144,000,000. Our coal resources, as shown by the investigations undertaken in connection with the International Geological Congress which was held in Canada last year, are in extent second only to those of the United States. The geological structure of the Dominion, moreover, is such as to lead to the confident belief that as detailed exploration is carried forward in northern Canada, large deposits of the metallic minerals will be found in that portion of the Dominion, so that the mining industry of the Dominion, there is reason to believe, will play a very important part in the future history of the country.

It is, however, of the greatest importance that we should avoid all waste in working these resources. The losses sustained in other countries from lack of care and thought in this respect are enormous. Dr. James Douglas estimates, for instance, to take only one example, that at the Rio Tinto mines in Spain in a period of some thirty years, through the unskilful treatment of the ore, about 7,000,000 tons of sulphur, valued at not less than $70,000,000, were wasted, while with modern improvements in the method of handling the ore, about 1,000,000 tons of sulphur are annually saved to the world which would otherwise have been burned and served simply to pollute the atmosphere. The same writer points out that only some 60 per cent of the hundreds of millions of dollars yielded by the Comstock lode was

recovered at the time, and at first the enormously rich tailings were not even collected, such was the haste of the miners to empty that stupendous deposit which should have made Nevada prosperous for generations instead of whirling the whole country into a mad dance of reckless speculation.

The primary cause of a large part of this waste is over-capitalization, which involves a large output at any expense if the value of the shares is to be raised and their price maintained. Over-capitalization generally demands over-production which in its turn almost invariably involves waste at some stage of the progress of the metal from the mine to the consumer.

Perhaps the most serious waste which is taking place in the Dominion at the present time in connection with its mineral resources is afforded by the mining and utilization of coal.

In the first place, in mining a coal seam from 50 to 90 per cent of the coal is left in the workings for the purpose of supporting the roof. Of the coal which is taken out and burned under boilers in the usual manner, only about 12 per cent of the total energy is developed. That is to say, we secure for useful purposes only about five per cent of the total energy contained in the coal of the area. If the coal is burned in gas producers and the gas so obtained used in internal combustion engines, these, having a higher efficiency, develop about 30 per cent of the energy in the coal which is actually mined, or about 12 per cent of the energy locked up in the coal of the whole area. This is an improvement but still represents an enormous waste.

On the other hand, the coal may be mined for the production of coke for metallurgical purposes. About three-fourths of the coke produced for this purpose in North America and all the coke made in western Canada is manufactured in bee-hive furnaces, which yield a relatively low percentage of coke while the other products of the coal—gas, tar, ammonia, benzol, etc.—go to waste. All these products may be saved by making the coke in by-product ovens, representing, in localities where the surplus gas can be sold at a reasonable rate, a gain which is estimated by Mr. F. E. Lucas, manager of the coke ovens of the Dominion Coal Company, at $1.98 per ton of coke made. This figure will of course vary with the locality in which the coke is produced, but it emphasizes the great saving which may be effected by the use of the modern by-product oven. The tar and ammonia obtained by this process, moreover, meet with a ready market. The former is already being used extensively in the Dominion for a variety of purposes, among them, as a binding material in the manufacture of briquettes from slack coal, thus enabling this waste product to be successfully

Natural gas boring at Pelican Portage, Athabasca river, Alberta. This has been burning since 1897, the waste during these 17 years having been enormous. It is 20 miles nearer to Edmonton than the Bow Island wells are to Calgary, but Edmonton is not yet supplied with natural gas.

PLATE D.

utilized, while the ammonia is a fertilizer of the greatest value, for which there is a great demand abroad and for which an ever-increasing demand will arise in Canada as the necessity of employing improved methods of agriculture is brought home to our farmers.

Fisheries

Not only is Canada richly endowed with natural resources which have their basis upon the land but she is bounded on three sides by the salt waters of the sea, and running through her domain are many streams and great rivers which have their origin in thousands of inland lakes, some of these being among the largest bodies of fresh water in the world. These waters abound—or should abound—in fish and other living creatures which constitute another of our great natural resources.

Canada ranks fifth among the nations of the world in the yield of its fisheries, in which it is estimated that 90,000 men are engaged, whose labour yields from 26 to 33 million dollars annually.

The fishing industry at the present time is carried on in three distinct and separate portions of the Dominion:—

The Atlantic Coast,
The Coast of British Columbia,
The Inland Waters.

There are also the oyster and lobster fisheries of the Atlantic coast and the fishing or rather hunting for whales and porpoises on the Arctic shores of Canada, in the waters of Hudson bay and the gulf of St. Lawrence.

(*a*) *The Fisheries of the Atlantic Coast*—"It may justly be claimed," says Mr. J. J. Cowie, "that no fishing grounds in the world are so favourably situated or so well adapted for the maintenance of the most valuable varieties of commercial fishes as those on the Atlantic coast adjacent to the shores of Nova Scotia, New Brunswick, Prince Edward Island and Quebec. The cold Arctic currents which flow over the many submarine plateaus situated in the North Atlantic within easy distances of the shores, bring with them vast quantities of the finest fish food and produce a temperature most suitable for the life and growth of the great commercial fishes; while the enormous numbers of bays and large inlets—veritable breeding places—into which flow great rivers full of anadromous fish life, contain abundant supplies of food for the attraction and sustenance of all kinds of salt water fishes. From whatever view these magnificent fishing waters are regarded, whether as a means of providing and maintaining a distinct industry, such as breeds hardy, skilful seamen, or as a means of supplementing the earnings of those dwellers by the seashore who engage in the

necessarily limited cultivation of the soil, they present themselves as a splendid heritage, which forms one of our finest natural resources."*

On the Atlantic coast there are the deep-sea fisheries conducted on the "banks" which lie between the in-shore area and the deeper waters of the Atlantic and yielding cod, haddock, hake and halibut, and the in-shore fisheries carried on from one to fifteen miles from land, yielding, in addition to these species, herring, mackerel, pollack, shad, flounders, sunfish, smelts, sardines and many other fish.

During the fifteen years, from 1870 to 1885, a steady advance was maintained in the value and importance of our Atlantic fisheries. In the first mentioned year, the value of the catch was $6,312,409, while in the last mentioned year it rose to $14,780,584. During the next twenty-five years, from 1885 to 1910, however, little or no progress was made, the aggregate value of the catch in 1910 showing an increase of but $834,900 over that of 1885. The number of fishermen engaged in the industry rose from 27,385 in 1870 to 51,498 in 1885; but this number was increased by only 685 during the succeeding quarter of a century.

While the aggregate value of these fisheries has remained at a standstill for a quarter of a century, there have recently been some indications of a new advance. This lies in the development of a trade in fresh fish in addition to that in salted fish, which up to the present time is the only form in which these fish have been marketed. In order to meet the demands of this trade, the fishermen must bring their catch to land in the shortest possible time and as a result no less than 2,304 boats of the fishing fleet have been fitted with gasoline engines and can thus land their fish in spite of head winds or calms.

Since 1908 steam trawling, the latest and most successful mode of capturing large quantities of fish ever put into operation, has been tried in a small way on the coast of Nova Scotia.

"With the increasing application of modern methods arises the question: Will the vaunted abundance of fish in Canadian waters remain unaffected? This question can only be answered by a study of the records of the fisheries of European waters, where steam trawling has been carried on so long, and where the fleets are so large. There, in the comparatively narrow North Sea, what would in Canada be called excessive fishing to a superlative degree goes on from January to December, year in and year out, by an immense fleet of trawling and other steam vessels without let or hindrance except within the three-mile limit. I would point out here, that climatic conditions in

*_Sea-Fisheries of Eastern Canada_—Commission of Conservation, 1912, p. 94; and _The Atlantic Fisheries_ in the series _Canada and its Provinces_, p. 561.

ANNUAL PRODUCTION OF FISHERIES OF BRITISH COLUMBIA, MARITIME PROVINCES AND INLAND FISHERIES OF CANADA

Salmon Fleet, Fraser River, in British Columbia. The Salmon Fishing Industry of the Fraser river is one of great value. It will probably be destroyed unless Canada and the United States can arrive at some agreement to prevent the wholesale catching of fish before they enter the river to spawn.

PLATE E.

Canadian waters provide a natural protection against depletion. For three or four months in each year there is an enforced close time, during which little or no fishing takes place, and during which even the operations of steam trawlers would be brought to a stand-still, owing to the severity of the weather. Indeed, the gulf of St. Lawrence—that immense fish-breeding area—is virtually closed to fishing from December to May, which period covers the spawning season for cod, haddock, hake and such fish."*

The fishing industry in the Maritime provinces could be very considerably developed and be made to yield larger returns if improved methods of curing, packing and shipping were employed under proper government inspection, in this way improving the quality of the salt fish sent to market. The Dominion Government has recently made an appropriation of $10,000 for the establishment of a fisheries intelligence bureau with the object of bringing before the fishermen in some concrete way information with reference to the best methods of curing and packing their fish. The Government has also made provision for the encouragement of the trade in fresh fish between the Atlantic and Pacific seaboard and the interior parts of the Dominion by paying a portion of the regular express charges on all shipments of fresh fish from the Atlantic coast to all points in Ontario and Quebec and from the Pacific coast to all points as far east as Winnipeg.

While, owing to local causes, certain kinds of fish, such as shad, are less abundant than formerly, there seems to be no indication of depletion of our Atlantic fisheries as a whole. The fact that the catch has not increased more rapidly in recent years is owing largely to a restricted market. The value of the annual catch is shown on the accompanying diagram.

(*b*) *The Fisheries of British Columbia*—The fishing industry in British Columbia presents a marked contrast, in many respects, to that of our Atlantic coast. Salmon is by far the most important fish taken and it is for the most part canned for shipment. The fish are taken when coming in from the sea to spawn in the rivers and are thus easily secured. The value of the salmon catch in British Columbia has increased enormously in recent years, amounting last year to over $14,000,000. The growth of the industry is shown in diagram.

Year by year the canneries are increasing the number and size of their plants and the number of their boats, while across the mouth of the Fraser river the nets form a veritable barricade. With such intensive fishing it can hardly be expected that the industry will not suffer. Although the run varies greatly in different years, the fish being

*J. J. Cowie in *Sea-Fisheries of Eastern Canada*—Commission of Conservation, 1912, pp. 107–109.

especially abundant every fourth year, a careful study of the subject by Prof. McMurrich goes to show that the supply of fish is gradually diminishing, and this opinion is shared by most of the canners, although the extension of their plants is contributing all the more rapidly to the extinction of the supply.

The question as to what can be done to conserve this most lucrative industry on our Pacific coast is one which presents peculiar difficulties. The salmon coming in from the sea to spawn in the Fraser river pass by the coast of the United States on the south side of the gulf of Georgia and are there taken in enormous numbers by United States fishermen. Up to 1908 the Canadian canners on the Fraser river were catching more than the Americans, but now the state of affairs is reversed and the Americans are catching twice as many as the Canadians. The conservation of these fisheries, therefore, is an international question and one which should be made a subject of immediate consideration by the Governments of the countries concerned, if this great industry so valuable to both countries is to escape destruction.

(*c*) *The Inland Fisheries*—The statistics for the inland fisheries of Canada, compiled by the Department of Marine and Fisheries, show that the value of their annual yield rose from $2,565,486 in 1876 to $5,359,429 in 1909-10. Since that time a change in the method of returning the statistics has been made, so that an exact comparison cannot be made with the figures of former years. The industry, however, is a growing one, which is to be expected, since new districts from which fish may be taken are continually being made accessible with the development of new means of communication. The data, however, are not available for an adequate discussion of these fisheries, even if the time at my disposal permitted me to enter upon this most interesting subject. Their preservation and extension is a matter to which the Government of the Dominion has devoted considerable attention and these aims have been furthered both by establishing close seasons for the several varieties of inland fishes and by artificial breeding. As an indication of the effects which have been produced upon the inland fisheries by the Government's action, the development and present status of the whitefish fisheries in the Great lakes may be taken. A very interesting study of this subject has been made recently by Mr. M. J. Patton for the Commission of Conservation. This fish, which has frequently been referred to as "America's finest food fish," is one for which the supply is never equal to the demand and of which, consequently, the price has risen rapidly in recent years. It is found

Floor of a British Columbia Salmon Cannery during a "Big run" year.

PLATE F.

in all the Great lakes, the waters of the Prairie provinces and of the Yukon.

Mr. Patton shows that:

(1) In lake Superior the average yearly catch twenty years ago (1886-1890) was more than twice as great as the average for the past five years (1906-1910). Since 1894 the trend has been rapidly downward.

(2) In lake Huron and Georgian bay the catch twenty years ago was nearly three times greater than it is now. The decrease begins with 1893.

(3) In lake Erie and the Detroit river, on the other hand, the average catch to-day is nearly four times as great as twenty years ago.

(4) And in lake Ontario, too, the average catch now is somewhat less than twice as great as a score of years ago.

In the two upper lakes, then, the trend of production is downward. Lake Superior does not produce half as many whitefish as it did twenty years ago, and lake Huron and Georgian bay only about a third as many. But in the two lower lakes the catch has been increasing; lake Erie, together with the Detroit river, produces nearly four times as much, and lake Ontario almost twice as much, as twenty years ago.

"There are two reasons why man must come to the aid of nature in maintaining the supply of this fish. The first is over fishing. The demand for whitefish is so great that the natural supply is speedily depleted. The second is that the whitefish has not now the facilities for breeding that it had before civilization pressed so close upon the shores of our Great lakes. A large area of the spawning and feeding grounds has been destroyed by industrial wastes, especially by sawdust; and from other areas the sensitive whitefish has been driven away by sewage-polluted waters. Modern conditions make it imperative that fish breeding operations be undertaken to prevent the depletion of our waters of this fish."*

The effectiveness of the Government fish breeding operations in the Great lakes is shown by the following facts:

"In lake Superior we are planting no fry at all—result: the catch now is less than half what it was twenty years ago. In lake Huron and Georgian bay the average plant for the last five years has been only about 700 a year per square mile of whitefish area, and the catch in those waters is only about a third of what it was twenty years ago. In lake Erie the average plant has been about 30,000 per square mile, (you will recall that Reighard said a plant of 20,000 was necessary to

*M. J. Patton in *Sea-Fisheries of Eastern Canada*, Commission of Conservation, 1912, p. 19.

produce a considerable increase in yield) and the catch has almost quadrupled in the last twenty years. In lake Ontario the plant has been comparatively small—about 3,000 on an average for the last five years—but the yield has increased nearly twice over what it was twenty years ago. This is probably explained by the light fishing preceding 1906, for the average catch for the five years 1901-1905 was only 139 pounds per square mile of whitefish area as compared with 279 for lake Huron and Georgian bay.

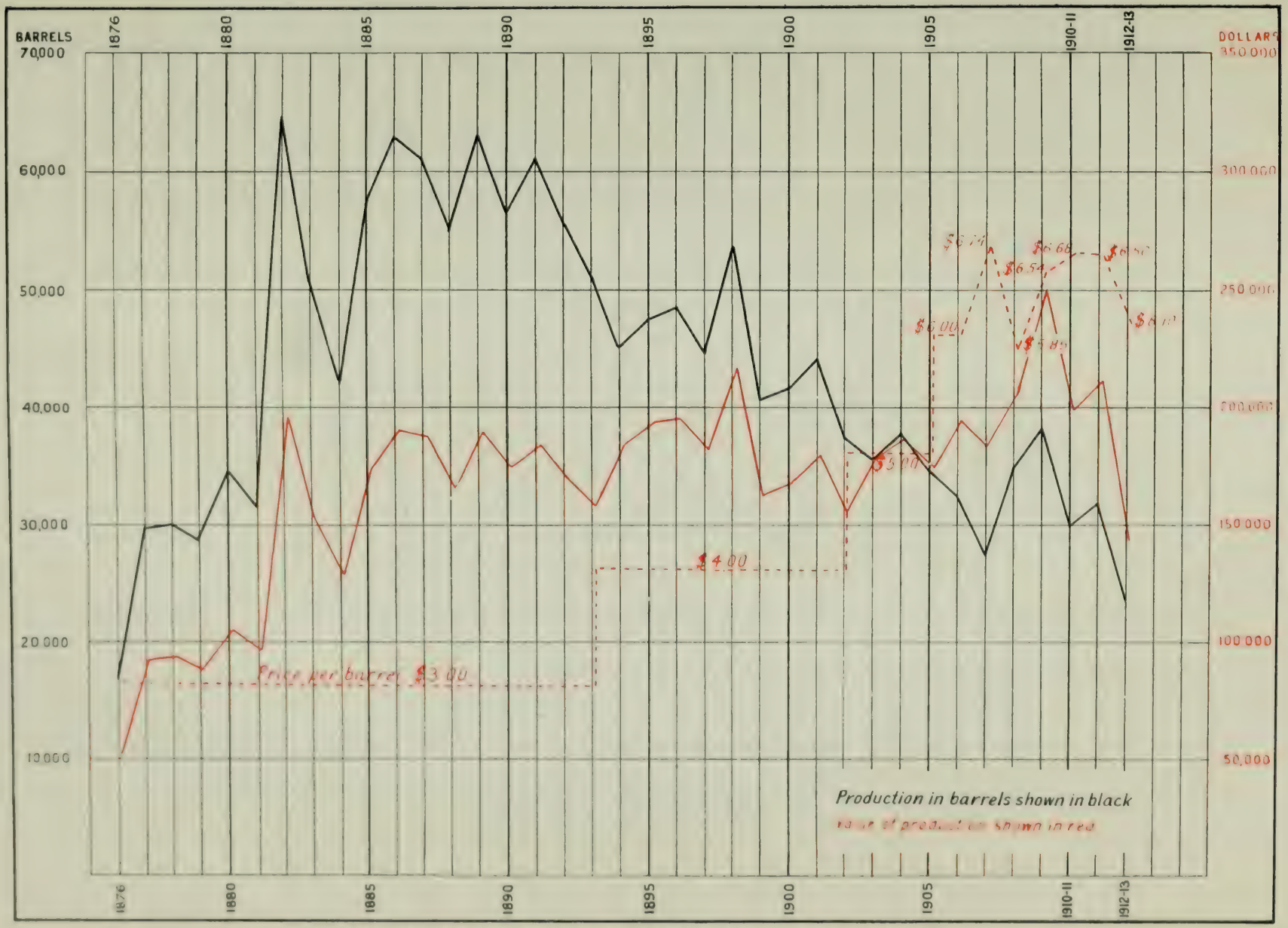
"The general conclusion to be drawn from these facts is that the planting of fry in sufficiently large quantities in the Canadian waters of the Great lakes has undoubtedly resulted in an increased yield of fish. This is plainly shown in the case of lake Erie where, notwithstanding the heavy fishing (an average of 594 pounds per square mile of whitefish area for the last five years) the large plant of young fry has resulted in almost quadrupling the catch as compared with twenty years ago. On the other hand, the catch in lake Superior, where no fry has been planted, and in lake Huron and Georgian bay, where a very small plant has been made, shows an alarming decrease.

"If a plant of whitefish fry as large as that made in lake Erie were made in these waters, I have little doubt that there would be a most appreciable increase in the catch within a few years' time."*

A similarly vigorous policy, if followed out in connection with trout, bass and sturgeon, and other inland fishes, would add immensely to the wealth of this portion of our national domain.

(*d*) *The Oyster Industry*—The oyster grounds of the Atlantic Coast provinces of Canada are well known as affording oysters of the finest quality. They come chiefly from the shores of Prince Edward Island. The accompanying diagram shows in graphic form the statistics of the oyster trade from the year 1873—when the first reliable returns can be obtained—to the present time. As in the case of certain of our other resources, the supply was at first supposed to be inexhaustible and the beds were ruthlessly exploited, with the result that while the output rose from about 12,000 barrels in 1875 to 64,646 barrels in 1882, and while from 1882 to 1893 the yearly production never fell below 50,000 barrels, it has now fallen to less than half that amount, the lowest point being reached in 1907 when the yield was only 27,299 barrels. The somewhat larger catch since that time is due to more vigorous fishing under the stimulus of higher prices, and not to any actual increase in the supply. The industry, in fact, is one which is fast dying out.

*M. J. Patton—*Whitefish of the Great Lakes* in *Sea-Fisheries of Eastern Canada*, Commission of Conservation, 1912, p. 20.



ANNUAL PRODUCTION OF CANADIAN OYSTER BEDS

While the supply has been falling off, the demand for oysters has been rapidly increasing. In the 20 years from 1892 to 1912 the price of oysters on the Canadian market rose 223 per cent, and we are now paying to the United States over $350,000 per annum for a product which we could easily supply in sufficient amount at least for the demands of our home market if the industry were properly managed and safeguarded.

The destruction of the beds has gone so far that in many areas the time has passed when simple restrictions will accomplish anything, the beds must be planted anew. Not only have the oyster beds been fished out, but the very bottom on which they grew has in many places been destroyed by the farmers along the shore digging up the mud from the bottom of the bays where the oyster beds are found, and even taking the oyster beds themselves for the purpose of fertilizing the soil of the adjacent fields. This has not only served to destroy the oysters thus removed, but the soft mud flowing over adjacent portions of the oyster beds which were left, killed all the remaining oysters in the surrounding area. This "mud digging" in the vicinity of oyster beds has now been made illegal. It is interesting to note that apart from the destruction wrought by man, the unfortunate bivalve has so many natural enemies that in order to maintain the normal number of oysters in any bed, each female oyster must deposit something like 16,000,000 eggs each year of its adult life. Brooks has stated that "If all the eggs were allowed to live and grow to maturity, they would fill the entire bay in a single season. The fifth generation of descendants would make more than eight worlds as large as the earth, even if each female laid only one brood of eggs." This gives some faint idea of what the struggle for existence means in the case of the oyster.

Other countries have already passed through the same experience as Canada and have found that their oyster beds which were supposed to be inexhaustible became sadly depleted by unrestricted fishing, but in every case where the Government of the country has made and enforced wise regulations, acting under competent advice, the industry has been revived. The solution has invariably been found in the cultivation of oyster beds by private enterprise. This has been the experience in England, France, Japan and the United States. In the latter country the value of the annual oyster supply is $18,000,000, of which $10,000,000 is derived from planted beds.

It seems, however, that a brighter future is in store for the industry in Canada. An unfortunate conflict in jurisdiction between the Dominion and Provincial parliaments was settled in 1912, the Dominion Government waiving its claim to grant leases in the oyster-produc-

ing areas in Canada, while retaining its right to full legislative jurisdiction.

The leasing of areas for the cultivation of oysters now rests entirely with the provinces, while the Federal Government makes and enforces the laws and regulations under which the oyster fishing is carried on. With the establishment of this agreement Prince Edward Island at once took steps to have its large areas, suitable for oyster cultivation, surveyed and sub-divided preparatory to leasing them. The general line of policy adopted should not only lead to a revival of the oyster industry but will, it is hoped, develop it far beyond the highest point that it ever reached in former years and thus, as remarked by Hon. Clifford Sifton in his annual address to the Commission of Conservation last winter,—"Our friends in Prince Edward Island will probably before long be able to show the rest of the Dominion that a small province largely removed from the possibility of the commercial development open to other provinces of the Dominion, is yet able, by the study of its natural conditions and the development of hitherto neglected lines of production, to attain an enviable degree of general prosperity."

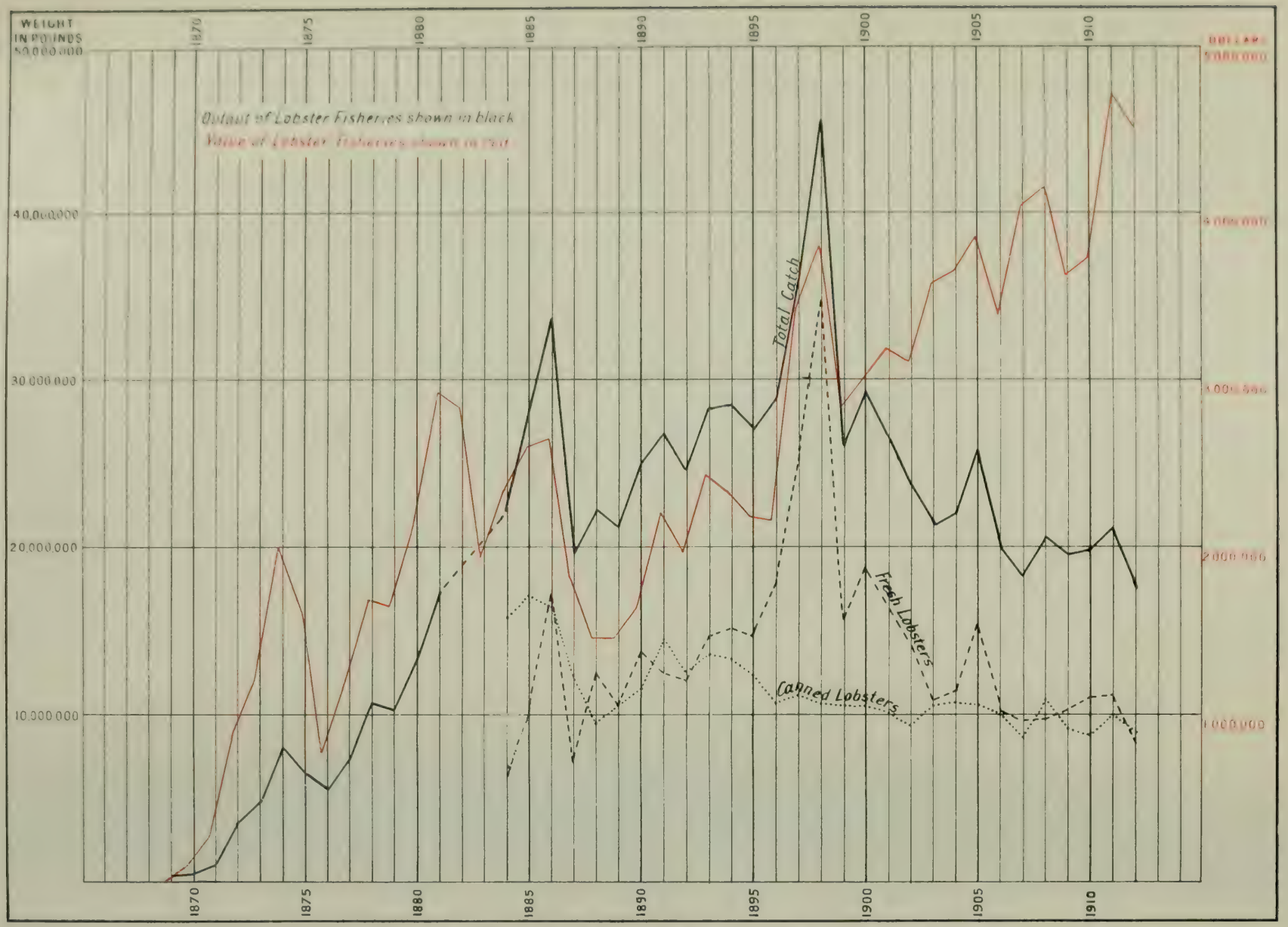
What is now needed above all things is that which it is the duty of the Dominion Government to supply—a properly organized and efficient oyster protection service placed under the rules and regulations of the Civil Service Act.

(*e*) *The Lobster Fisheries*—Along the shores of Eastern Canada there are perhaps the most remarkable grounds for lobster fishing in the world. During the past forty years they have produced a greater number of lobsters than any other part of the globe.

In former times and as late as the sixties, lobsters were so abundant, along the whole 5,000 miles of coast between Passamaquoddy bay and Labrador that after a heavy storm it was no uncommon thing to find windrows of them stranded on the coast, and these, in the settled regions, were often carted away by the farmers and used to fertilize their lands.

The canning of lobsters was started in the sixties and in 1869 61,000 one-pound cans were produced; the next year the quantity increased to half a million cans, and in 1871 over a million pounds of canned lobsters were produced. In 1881 the output exceeded 17,000,000, when it commenced to decrease till about 1898 when it had reached between 10,000,000 and 11,000,000 pounds. Since that time it has shown a further decrease, about 9,000,000 pounds being now canned annually.

UNITED WILD WATER CANOE RACE CANADA



OUTPUT AND VALUE OF LOBSTER FISHERIES OF CANADA

In addition to the lobsters which are canned, live lobsters commenced to be exported in the early eighties, and at the present time between 100,000 and 120,000 cwts. are shipped in this form. The statistics show that there has been a considerable falling off in the number of live lobsters shipped in recent years.

There are now nearly 700 canneries in the Maritime provinces, representing an investment of over $2,000,000 and giving employment to over 19,000 persons. The industry is second only to that of the cod fisheries.

The Government statistics are somewhat confused, the returns in different series of years being made in cases, cans, pounds, cwts., tons, etc., as the industry developed. These I have had reduced to pounds, thus making it possible to compare the annual output in successive years. These figures with value of the product plotted as curves are shown in the accompanying diagram. From an examination of the curve of production it will be seen that notwithstanding the ever increasing vigour with which the industry is being prosecuted, stimulated by the growing demand with rising prices, the yield is falling off. There is not only a decrease in the aggregate catch, but the lobsters now caught are much smaller. This decrease in size is always one of the first signs of the decadence of a fishery.

In the case of lobster fishing, as in the case of so many other industries based on our natural resources, when the industry was started the lobsters were so extraordinarily abundant that the fishermen never dreamed that the day would come when any protection would be required, but the Government has been obliged to enact a series of regulations ever more restrictive in character, without which the industry would have been in a much more serious condition than at present. These regulations, however, are not always effectively enforced, and, as stated by Mr. W. A. Found, the Superintendent of Fisheries for Canada, in his excellent paper read before the Commission of Conservation in the year 1912, "it is very much to be feared that if more restrictive regulations are not enforced we can expect nothing but a continued decline in the lobster fisheries."

(*f*) *Whale and Walrus Fisheries*—In connection with the fisheries of the Dominion of Canada reference may be made to the hunting of whales, walruses and other of the great beasts inhabiting our northern waters.

In the early years of the settlement of eastern North America whales were very abundant along the coast of New England and even further south. Thatcher in his *History of Plymouth* tells us that the early settlers were at first undecided whether to adopt Cape Cod as

their new home or to look for some more attractive site, and that one of the main arguments in favour of the Cape Cod locality was the fact that—"large whales of the best kind for oil and bone came daily alongside and played about the ship. The master of the ship, his mate and others experienced in fishing, preferred it to the Greenland whale fisheries."* And in the Journal of Richard Mather, who came to Massachusetts Bay colony in 1635, he tells of seeing off the coast of New England "mighty whales spewing up water into the air like the smoke of a chimney . . . . . of such incredible bigness that I will never wonder that the body of Jonah could be in the belly of a whale." It is generally conceded that along with the idea of religious freedom, one of the main purposes in the settlement of Massachusetts was the founding of a fishing colony. The whale fishing along that portion of the coast of North America became as years went on one of the great industries on which the early success of New England was founded.

As a result of the vigorous prosecution of this work, the whales were eventually killed off all along the coast and the American whalers extended their operations further and further north. The "whaling grounds" on the eastern side of North America at the present time are restricted to Davis strait, Baffin island and the northern parts of Hudson bay. Here, both Scotch and American whalers found an abundant harvest. In the decade from 1868 to 1878, the statistics show that the Scotch fleet every year took from 80 to 190 whales in that region in addition to a few taken by the American whalers. This industry eventually fell almost entirely into the hands of the Americans and the catch rapidly fell off, only 12 whales being taken by the combined fleets in 1904, and since that time the number secured has apparently been still less. The unfortunate whales were however still hunted, for the price of whalebone rose as the supply diminished until a single large whale brought its slayers a return of from $15,000 to $20,000.

Commander Low, writing in 1906, says of the industry in Hudson bay and the adjacent parts of the north-eastern coast: "The future of the whaling industry appears to be very gloomy. The annual catch is decreasing regularly, and only the high price of whale-bone makes it at all profitable. There is no certainty that a ship can secure a single whale, and the enterprise is reduced to almost a gambling chance."† Captain Bernier, in 1909, writes:—"The whaling has this year been a total failure in the Arctic Sea, only three whales having been caught. It must, therefore, be admitted that, at least for the present, the whaling

*Starbuck—*History of the American Whale Fisheries*, p. 5.

†*Report on the Dominion Government Expedition to Hudson bay and the Arctic islands on board the D.G.S. Neptune*, 1903-1904, p. 272.

fishery is exhausted. There has not been, and cannot be, a revival of this industry until there is, first, a renewal of the supply of whales, and, at the present time, there appears to be no prospect of this. Taking into consideration the state of things at present, a closed season should be now enforced and remain so for ten or fifteen years, so as to give the whales time to multiply."*

With the decline of the whale fisheries on the Atlantic side of the continent, the American whaling fleet sought new grounds in the Pacific, and commencing along the coast of Chili they gradually extended their operations further north, killing off all the whales in one district after another. They eventually reached the coast of Kamchatka and the Okhotsk sea. Then for several years the chief cruising grounds in the North Pacific were along the north-west coast of America and south of Bering sea, while still later they passed west into the Arctic ocean, north of Bering strait. Upon their arrival here, the value of this Arctic fishery became at once apparent and the fleet frequenting the Arctic grounds increased rapidly in numbers. For the last few decades it has been the most important of all whaling regions, almost all the Pacific whalers cruising in Arctic waters.

With the introduction of the steam whaling vessel, there arose the practice of remaining in the Arctic during the winter in order to be earlier on the grounds in the spring when the ice broke up, and by 1893 one-fourth of all the vessels whaling in the North Pacific and Arctic oceans wintered off the mouth of the Mackenzie river in Canadian waters.†

In 1904, the Canadian North-West Mounted Police reported that the American whaling fleet had practically abandoned Herschel island at the mouth of the Mackenzie and had established a new rendezvous at Baillie island, 300 miles further east on the Canadian coast, where all the ships that remained in the north wintered.

In 1906 the mounted police reported that three of these ships had pushed still further east and wintered at Langdon bay, at the extreme end of Franklin bay, but that it is not probable they will be able to extend their operations east of this point on account of the fact that, if they do, they will not be able to get out in time the following spring.

The difficulty of navigating these northern waters, the series of disasters which have overtaken the whalers in the ice, and the fact that the catch has greatly declined, as well as the circumstance that the whalers cannot get further along the Canadian coast, have resulted in a great decline of whaling in these Arctic waters. From this industry

*Report of the Dominion Government Expedition to the Arctic islands and the Hudson strait on board the C.G.S. "Arctic," 1906–1907, p. 76.

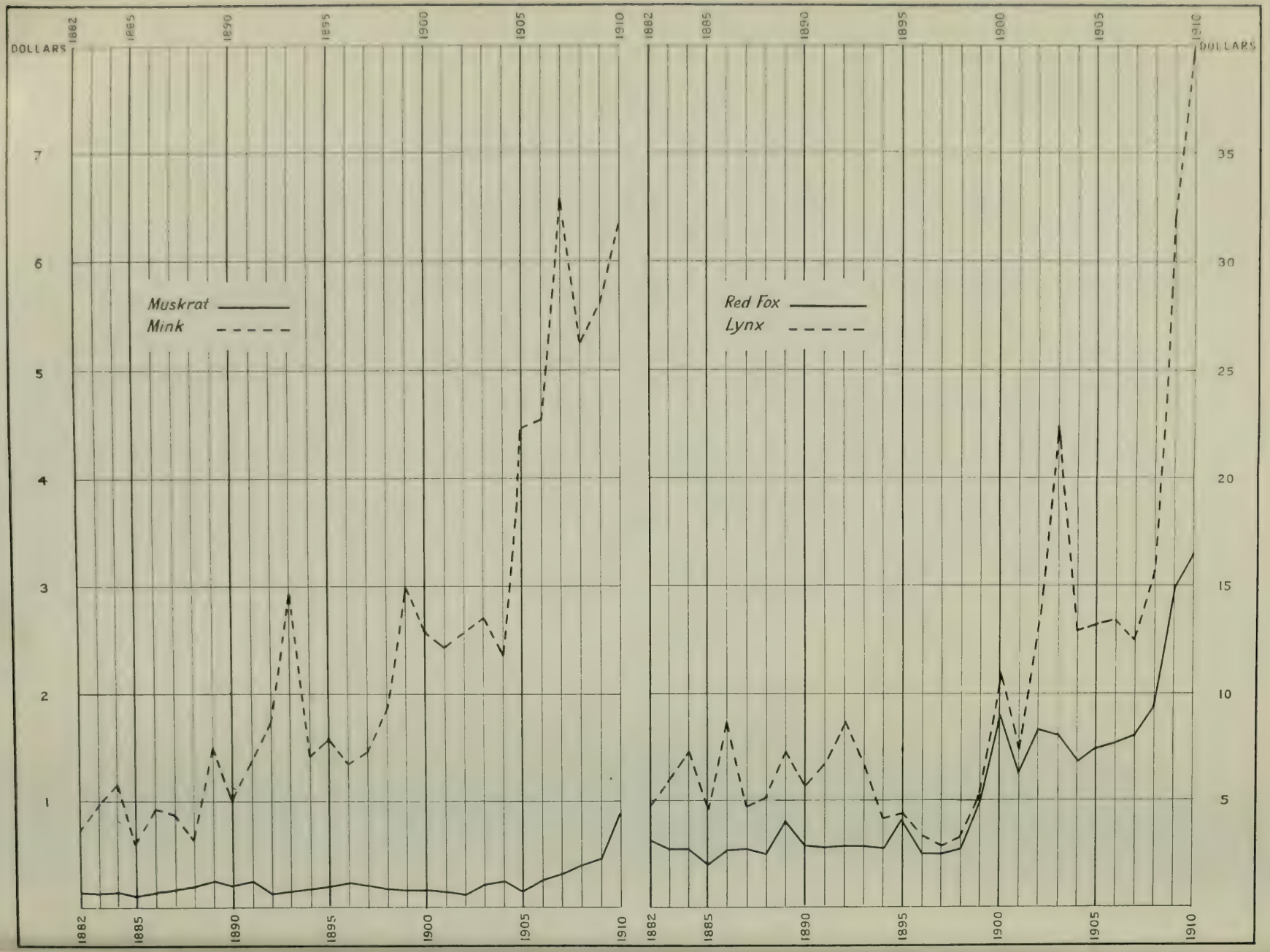
†Tower, W. S.—*A History of the American Whale Fishery*, Philadelphia, 1907.

conducted in Canadian waters, Canada has no benefit, although she has been obliged to keep an outpost of the Mounted Police at Herschel island to see that the Canadian Eskimo were properly treated by the whalers. The industry is altogether in the hands of Americans, who, having killed off all the whales in the waters of north-eastern Canada, have transferred their vessels to the Arctic waters which are reached from the Pacific coast, and are there following the same process of extermination which has already led to the practical annihilation of the South Sea whale.

A similar process of destruction is being carried on in the case of several of the other denizens of the Arctic sea, among which I can here mention only one, namely the walrus. The case of this animal is well put by Commander Low in his *Voyage of the Neptune*, to which reference has already been made:

"When the St. Lawrence was discovered, the walrus was found as far south as the Magdalen islands, and, within a comparatively recent time, they were common on the Atlantic coast of Labrador; now they are only killed rarely at cape Chidley, the northern point of that coast. On Hudson bay they were formerly found as far south as Paint islands, on the east side of James bay, but now they do not frequent that coast south of latitude 60° N., and their southern limit is about latitude 57° N., on the Belcher islands. There has been a rapid diminution in the number of walrus in the northern part of the bay during the past few years, since the *Active* has been engaged in their capture, and it is only a question of a few years, if the present methods of killing are continued, before the walrus will become as rare as the right whale in the waters of Hudson bay. It is acknowledged that, with present methods of capture and the difficulties of the chase, only one in four or five of the animals killed is eventually secured. The walrus is necessary for the subsistence of the northern Eskimo and his dogs. The flesh is strong and sustaining, the blubber is abundant and good, while the tusks are of great use for shoeing sleds and the manufacture of spears and harpoons, and other hunting and domestic gear. The present value of the walrus to civilization is small. Oil is made from the blubber, and the skins are used chiefly for "buffing" metal goods. The ivory of the tusks is inferior, and only worth about fifty cents a pound. The present price for hides is from eight to ten cents a pound, and consequently the entire products of a large walrus are under fifty dollars in value.

"Taking into consideration the value of the animal to the native, the great waste of life in the killing, and the comparatively small value


DOLLARS
1882
1885
1890
1895
1900
1905
1910
7
6
5
4
3
2
1
Muskrat
Mink
DOLLARS
35
30
25
20
15
10
5
Red Fox
Lynx

to civilization, it might be well to pass regulations reserving this animal wholly for the use of the Eskimos."

The Fur Trade

The rise of the fur trade was almost coincident with the discovery of Canada, and with the establishment of the great fur trading companies their agents penetrated ever farther into the interior of the country until fur trading stations had been established in every accessible part of the area now embraced within the borders of the Dominion of Canada.

In recent years the ever advancing network of railway and steamboat communication has made it possible for hunters to carry their provisions and supplies into remote recesses of the continent which have hitherto been practically inaccessible. The last retreats of the fur-bearing animals have been invaded by their remorseless enemy, man. The musk-ox, for instance, has only figured in the London sales during the last 40 years—before that time the hunters of the Arctic regions were unable to reach its habitat; the continued invasion of its territory makes its extinction more than probable in the not distant future.

As a result of these inroads, the fur-bearing animals are everywhere decreasing in number, and notwithstanding the fact that hunting is everywhere being carried on with increasing vigour by the aid of modern guns, smokeless powder, improved traps and the most alluring baits and scents, the supply of furs obtained is constantly diminishing. Coincident with the falling off in the supply, there has been a remarkable increase in the demand for furs, especially for the most costly varieties. This has been most marked during the past 20 years owing to the increase of population and wealth among the people of northern countries where furs are required not only for comfort but also to satisfy the requirements of fashion. The value of the furs exported from Canada in the year 1913 was $5,415,118. This increased demand has, of course, been accompanied by a steady rise in price. This is illustrated by the following table showing the prices brought by certain staple skins at the great fur auctions in London in successive years.

Year	Muskrat YF I	Mink YF II	Red Fox YF I dark	Lynx YF I large
	$	$	$	$
1882	.16	.73	3.11	4.87
1883	.15	.97	2.75	6.09
1884	.16	1.16	2.75	7.31
1885	.12	.59	2.07	4.51
1886	.16	.93	2.56	8.72
1887	.17	.89	2.60	4.70
1888	.19	.65	2.50	5.05
1889	.25	1.50	4.05	7.38
1890	.22	1.03	2.92	5.73
1891	.25	1.36	2.82	6.75
1892	.15	1.74	2.92	8.70
1893	.17	2.92	2.92	6.70
1894	.18	1.42	2.75	4.13
1895	.19	1.58	4.20	4.39
1896	.24	1.34	2.50	3.33
1897	.22	1.36	2.50	2.87
1898	.18	1.89	2.66	3.23
1899	.16	2.98	4.97	5.12
1900	.16	2.58	9.00	10.80
1901	.15	2.44	6.20	7.44
1902	.13	2.58	8.27	13.38
1903	.22	2.70	8.03	22.40
1904	.25	2.37	6.81	12.80
1905	.17	4.46	7.48	13.15
1906	.27	4.54	7.67	13.38
1907	.31	6.58	8.07	12.50
1908	.41	5.25	9.25	15.60
1909	.47	5.61	14.96	32.00
1910	.87	6.34	16.55	39.85

While the more costly furs are in ever-increasing demand notwithstanding their ever-increasing price—for the mere fact that they are enormously expensive creates an inextinguishable desire for them on the part of certain people—there has arisen an increasing demand for cheaper furs also. Scarcely any animal that has a furry coat is now safe to walk abroad, for some one seizes and slays it, although the

Foxes in "Ranch."

Karakul Lambs three days and eight days old respectively. Both are in prime condition for killing. Born on Bunbury Farm, Prince Edward Island.

PLATE G.

pelt continues its existence under a name and often under a guise in which its original possessor would never recognize it. Thus:

Goats	become	transformed	into	Bears
Hares or Minks	"	"	"	Sables
Muskrats and Rabbits	"	"	"	Sables or Seals or Electric Seals
Opossum	"	"	"	Beaver
White Rabbits	"	"	"	Ermine
White Hares	"	"	"	Chinchilla
Raccoons	"	"	"	Silver Bear

Even the domestic cat, hitherto an unappreciated national asset, having exchanged its plebian designation for one which finds more acceptance in good society, "arrives," and in so doing often helps its wearer to do so also.

Notwithstanding all the art and artifices of the fur dresser, the supply of good fur continues to decrease and one fact stands out clearly, namely, that to meet the demand we must domesticate and breed our fur bearing animals and no longer rely on hunting them. This change is to be welcomed for humanitarian reasons as well as for many others, since the most atrocious cruelty is perpetrated on our wild animals in almost every kind of trapping, the creatures often lying not only for hours but for days with crushed and broken limbs, maimed and smashed before the hunter arrives and finally relieves their suffering or some other animal finds them and tears them to pieces.

Furs can, of course, only be produced under certain climatic conditions and these are nowhere more favourable than in our Dominion. The breeding of fur-bearing animals is an industry of great promise which should, if carried on in a conservative and rational manner—as any other industry must be to meet with success—have a great future in Canada and be an additional source of wealth to the Dominion. It is not, I think, generally recognized that a number of the more important of these animals are already being bred in captivity—several of them in Canada—with success, although as yet only on a small scale. Among these are foxes of several varieties, mink, marten, fisher, Russian sable, beaver, muskrat, raccoon and skunk. The skins of the animals bred in captivity bring a higher price in the market than the skins of the same animals taken in the forest. Fox farming, especially in Prince Edward Island, indeed, although more or less discredited by the excessive speculation with which it has been associated, has proved to be a successful industry and one which is capable

of great expansion. The government returns show that there were on Prince Edward Island on January 1st, 1914, 277 fox "ranches," containing 3,178 foxes, of which 1,602 were silver foxes. In the returns in question these animals are estimated to have a value of $14,978,000.

The black and dark silver skins from foxes produced on the Prince Edward Island ranches have rarely brought less than $500 apiece and frequently over $2,000 at the London auction sales.

Another venture, the result of which will be awaited with much interest, is the attempt to breed karakul sheep in Prince Edward Island. It is from these animals that the well known and highly prized fur known as Persian lamb is obtained. An importation of this stock has recently been made at Charlottetown, and some of the lambs born on the Bunbury farm are shown in Plate G.

Much could also be done to prevent the extermination of our fur-bearing animals by making not only our national parks but our forest reserves "sanctuaries" for the animals which are their natural denizens. A sanctuary has been defined by Col. Wm. Wood as a place where man is passive and the rest of nature active. This can be done by maintaining a really efficient system of patrol, with the prompt arrest and punishment of all who break the forest laws. Our national parks are so protected and it is found that the animals rapidly increase in them and spread out into the surrounding forest. Our forest reserves, however, are absolutely without protection or patrol.

Sanctuaries might also be established in other parts of our northern country, for it must be borne in mind that much of it has no economic value except as a hunting ground, and it is, therefore, of the first importance to take steps, before it is too late, to prevent the disappearance of its fur-bearing animals. The general decrease in the number of these latter during the past 20 years shows how inefficient the establishment of close seasons from time to time has been to this end. As has been well said by Mr. J. Walter Jones, in his report on fur farming for the Dominion Commission of Conservation:

"The whole problem of the protection of wild animals and the possibility of propagating them in captivity opens up broad questions that require more attention than has been given them in the past. A Dominion Furriers and Fur-Farming Association organized along similar lines to the Canadian Forestry Association and, like the latter, publishing its own journal, could do much to promote a healthy interest in protecting and propagating wild life. The organization of provincial associations would be the first logical step in such a movement. Representatives of the fur trade, the fur farms, the game wardens and com-

missioners, and the government experts could be called together for the purpose of establishing such a permanent national organization."

In this connection, it may be mentioned that the preservation of our wild bird life is also a subject concerning which immediate action should be taken. A bill has recently passed the United States Congress providing Federal protection for migratory birds. It was shown that the United States farmers and foresters sustained an annual loss of $800,000,000 through the disturbance to nature's balance consequent upon the destruction of insectivorous birds, and the officers of the Geological Survey of Canada estimate that the annual loss sustained in the Dominion from this cause probably amounts to $80,000,000.

In connection with the domestication of wild animals, a word may here be said with reference to a very interesting experiment which has recently been made by the Dominion Government, namely, the importation of reindeer from Lapland.

In western Europe, north of the forest-clad zone, there is a great belt of country practically treeless, the surface of which, however, is covered with an abundant growth of thick moss. This country stretches across the northern portions of Norway, Sweden and Russia (Finland), and is known as Lapland. The reindeer is the only animal which can feed upon this moss and transform it into milk, meat and hides. The Laps who inhabit this inhospitable land have for centuries kept great herds of these reindeer in a semi-domesticated condition and have lived almost exclusively upon them. There are about 4,000 Laps in Swedish Lapland, and these have about 200,000 reindeer.

The greater part of the herds are still in a half wild condition. They remain during the winter months in the woodland, but as the summer approaches, they slowly move north, some of them even passing over the mountain range which separates Sweden from Norway, and spend the summer months in the Norwegian valleys and on the islands of the fjords. When the fall comes, they turn again from the coast toward the mountains and then back into the woodlands. As they move, the Laps move with them, keeping their herds "rounded up" with the assistance of their faithful, intelligent and untiring dogs, and at the same time waging a constant warfare on the wolves and gluttons which attack the reindeer. The time and extent of these migrations are determined by the reindeer themselves, who often move without any previous warning. A small number of the reindeer, however, are selected from these herds and thoroughly domesticated. From some of these the Laps obtain an abundant supply of milk and others are trained to work in harness, thus doing the work for which in more southern lands horses are employed. A well trained reindeer will draw

as much as several of the dogs which are used in the north country, and, while not as fleet as the best dogs, a good strong reindeer will carry a man with his baggage in a sled for long distances day after day. They, furthermore, are much superior to dogs in that the dog must draw his own food as part of his load, and on long trips they can haul little more than their own food supply. The reindeer, on the other hand, when feeding time comes are merely turned loose and no matter how cold the weather or how deep the snow, they can paw their way down to the moss beneath and thus supply themselves with abundant food even on the longest and roughest trips. The Laps, although for the most part a more or less nomadic people, by no means lack either education or a certain degree of culture, and obtain from their herds of reindeer practically everything which they need for their support and nourishment.

In Plate H. two photographs are reproduced showing reindeer in Lapland—the first being a herd of reindeer in migration and the second a Lap on a journey with a number of his reindeer hauling his goods and equipment.

In northern Canada, there are enormous stretches of country very similar to Lapland in character, treeless but covered with thick moss. The same is true of Alaska and northern Newfoundland.

About the year 1892 the Government of the United States imported a herd of reindeer from Siberia and engaged a number of Laps to care for them and instruct the Eskimos in the details of their management. Native herders are taken on as apprentices and paid their wages in reindeer—the object of the Government being eventually to have all the reindeer distributed among the Eskimos, thus lifting these people, who formerly obtained a precarious existence by hunting, to the estate of civilized, self-supporting herdsmen. In this the "Alaska Reindeer Service" has been very successful. The total number of reindeer in Alaska at the last census was 23,000 and of this number over 11,000 were owned by natives, who derive a good living from them.

The domestication of the reindeer has a direct interest to Canadians owing to the fact that, in 1907, Dr. Grenfell, believing that Labrador and the Ungava peninsula, Que., would afford an excellent habitat for these animals, collected a fund, to which the Canadian Government subscribed the sum of $5,000, for the importation of a number of reindeer. A small steamer was accordingly chartered and an agreement made with an agent in Norway to purchase 300 reindeer and to have collected and baled up 75 tons of the moss on which these animals feed, the whole to be delivered on a certain specified date at a point on the Norwegian coast where it was

Herd of reindeer in migration

A Lap on a journey. Reindeer hauling his goods and equipment

PLATE II.

to be taken on board the steamer. Some Lap herders were also engaged to come over with the reindeer, and the ship discharged its cargo safely near St. Anthony on the coast of Newfoundland. Here there is an abundant supply of reindeer moss and the animals have thriven excellently. The herd now numbers 1,200 and promises to form the basis of a very profitable industry.

During the summer of 1910, His Excellency the Governor General, Earl Grey, after having made a long journey through sub-Arctic Canada, visited Dr. Grenfell's mission and was impressed with the desirability of further extending this experiment by establishing herds of reindeer in north-west Canada. Fifty reindeer were accordingly obtained from Dr. Grenfell as well as two herders and an apprentice to look after the herd; three trained dogs and a supply of moss sufficient for the journey from Newfoundland to the locality chosen, which was near Fort Smith on the Slave river, being nearly on the northern boundary of Alberta. Nineteen of the deer died *en route*, but the remainder of the herd reached Fort Smith safely and in good condition. A considerable number of the deer have since died however, probably owing to too close confinement. If, however, this district proves to be a suitable one, a further shipment of reindeer from Newfoundland will probably be made, and it is hoped that not only at Fort Smith but in many places on the barrens of far northern Canada a valuable industry may thus arise in districts which would otherwise ever remain a wilderness.

Conclusion

In conclusion it may be said that we have seen that Canada has been blessed with great natural resources. Each and all of these, however, already show signs of serious depletion.

Our mineral resources, like the mineral resources of every country, are in the very nature of the case being depleted in direct proportion to the growth of our annual output of the products of mine and quarry.

Our forests, which are by no means so extensive as is generally supposed, have been cut, slashed and burned in a reckless manner. Our agricultural lands, although showing an ever-increasing output on account of the opening up of new tracts of virgin soil, are not yielding even approximately the returns of which they are capable were they farmed according to more improved modern methods. Our water-powers cannot be maintained at their maximum efficiency if the forest areas of their catchment-basins are not preserved. The fisheries of British Columbia and of our inland waters are seriously threatened. With the continued advance of settlement, our wild fur-bearing animals are in danger of extermination.

Each and all of these resources of our national domain (with the exception of the mineral deposits) can, however, not only be restored to its original condition but may, if we take vigorous action at the present time, be conserved, cultivated and not only be made to yield a higher annual return than at present, but while doing so to increase in value year by year, and be handed on by each generation to the succeeding one in a better and more productive condition than that in which it received them.

It is time for the people of Canada to awake to the realization of these facts, and in so doing to remember that in the last analysis the success of any policy of conservation depends upon the efficiency of the human unit.

The instinct of the savage which still survives in the ordinary man, inclines him to seize what he can now and for himself, and let others, including posterity, take their chance. The national instinct for the preservation of the State does not, however, lend itself to any such practice of personal aggrandizement and selfish waste.

Canada should learn the lesson exemplified in the rise of such a powerful state as Germany—relatively poor in natural resources but becoming rich by their careful conservation and able husbanding. This conservation is part of that "righteousness which exalteth a nation."

And, finally, let us remember that, in the words of Dr. James Douglas, "we should be preservers of the gifts with which a beneficent Providence has stored our world, for next to being a Creator, man reaches his highest position in being a saver—a saviour."

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